TURBONutter

Lada Niva 4x4
Service Manual
Fuel Injection

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For Lada parts, advice and general all round Lada wonderfulness these blokes aren't bad:

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3. SERVICE OPERATIONS

NOTICE: When fasteners are removed, always reinstall them at the same location from which they were removed. If a fastener needs to be replaced, use the correct part number fastener for that application. If the correct part number fastener is not available, a fastener of equal size and strength (or stronger) may be used. Fasteners that are not reused, and those requiring thread locking compound will be called out. The correct torque value must be used when installing fasteners that require it. If the above conditions are not followed, parts of system damage could result.

SERVICE PRECAUTIONS

DRIVEABILITY AND EMISSIONS CONTROL

An electronic control module is designed to maintain exhaust emission levels at government standards while providing good driveability and fuel efficiency. The functions of the system are based on data gathered by sensors and switches located throughout the vehicle. The electronic control module maintains control over fuel delivery, ignition, idle air flow, the fuel pump and other system components, while monitoring the system for faulty operation with its diagnostic capabilities.

It is important to review the component sections and wiring diagrams to determine which systems are controlled by the electronic control module.

MAINTENANCE SCHEDULE

Refer to the Maintenance Schedule in the owner's handbook for the maintenance service that should be performed to retain performance.

BLOCKING DRIVE WHEELS

The vehicle drive wheels should always be blocked and parking brake firmly set while checking the system.

WHAT THIS SECTION CONTAINS

"Driveability and Emissions Service Operations," Section "3" describes the proper service procedures to repair components of the Engine Management system that controls the driveability and emissions of the vehicle. Emphasis is placed on the proper procedures and repair of components related to the system.

VISUAL/PHYSICAL UNDERHOOD INSPECTION

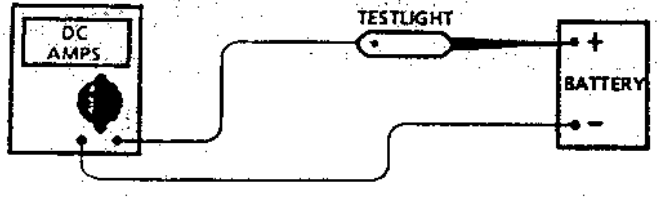
A careful visual and physical underhood inspection must be performed as part of any diagnostic procedure or in finding the cause of an emissions test failure. This can often lead to fixing a problem without further steps. Inspect all vacuum hoses for correct routing, pinches, cuts, or disconnects. Be sure to inspect hoses that are difficult to see beneath the air cleaner, compressor, alternator, etc. Inspect all the wires in the engine compartment for proper connections, burned or chafed spots, pinched wires, or contact with sharp edges or hot exhaust manifolds. This visual/physical inspection is very important. It must be done carefully and thoroughly.

SERVICE PRECAUTIONS

The following requirements must be observed when working on vehicles:

1. Before removing any electronic control module system component, disconnect the battery ground cable.
2. Never start the engine without the battery cables being solidly connected.
3. Never separate the battery from the on-board electrical system while the engine is running.
4. When charging the battery, disconnect it from the vehicle's electrical system.
5. Never subject the electronic control module to temperatures above 80°C i.e., paint oven. Always remove the electronic control module first if this temperature is to be exceeded.
6. Ensure that all cable harness plugs are connected solidly and that battery terminals are thoroughly clean.

7. The engine management system harness connectors are designed to fit only one way; there are indexing tabs and slots on both halves of the connector. Forcing the connector into place is not necessary if it is installed with the proper orientation. Failure to match the indexing tabs and slots on the connector can cause damage to the connector, the module, or other vehicle components or systems.
8. Never connect or disconnect the electronic control module connectors when the ignition is switched "ON."
9. Before attempting any electric arc welding on the vehicle, disconnect the battery leads and the electronic control module connectors.
10. When steam cleaning engines, do not direct the steam cleaning nozzle at electronic control module system components. If this happens, corrosion of the terminals can take place.
11. Use only the test equipment specified in the diagnostic charts, other test equipment may give incorrect results or damage good components.
12. Make all voltage measurements using a digital voltmeter with an internal impedance rating of at least 10 million ohms per volt.
13. When a test light is specified, a "low-power" test light must be used. Do not use a high wattage test light (i.e.: headlight). While a particular brand of test light is not suggested, a simple check of any test light will ensure it is safe for electronic control module circuit testing. Connect an accurate ammeter (such as the high-impedance digital multimeter) in series with the test light and power the test light-ammeter circuit with the vehicle battery.



If the ammeter indicates ***less*** than 1/4 amp current flow (.25 A or 250 ma), the test light is **SAFE** to use.

If the ammeter indicates ***more*** than 1/4 amp current flow (.25 A or 250 ma), the test light is **NOT SAFE** to use.

Electrostatic Discharge Damage

It is possible for less than 100 volts of static electricity to cause damage to some electronic components. Electronic components used in control systems are often designed to carry very low voltage, and are very susceptible to damage caused by electrostatic discharge. By comparison, it takes as much as 4,000 volts for a person to even feel the zap of a static discharge.

There are several ways for a person to become statically charged. The most common methods of charging are by friction and by induction. An example of charging by friction is a person sliding across a car seat where a charge of as much as 25,000 volts can build up. Charging by induction occurs when a person with well insulated shoes stands near a highly charged object and momentarily touches ground. Charges of the same polarity are drained off leaving the person highly charged with the opposite polarity. Static charges of either type can cause damage; therefore, it is important to use care when handling and testing electronic components.

NOTICE: To prevent possible Electrostatic Discharge damage:

- Do Not touch the electronic control module connector pins or soldered components on the electronic control module circuit board. Never disassemble the electronic control module metal case, except for the calibrator cover.
- When handling an engine calibrator, Do Not remove integrated circuit from carrier.

REPAIR PROCEDURES

ELECTRICAL REPAIRS

This part provides instruction in the following repairs:

- Circuit Protection.
- Typical Electrical Repairs.
- Replacing terminals on unsealed components.
- Replacing pigtails on sealed components.
- Replacing connector housings on unsealed components.
- Splicing Copper Wire.
- Splicing Twisted/Shielded Cable.
- Repairing Connectors (Except Weather Pack®).
- Repairing Weather Pack® (Environmental) Autofuse Connectors.
- Terminal Repair.

After any electrical repair is made, always test the circuit by operating the devices in the circuit. This confirms not only that the repair is correct, but also, that it was the cause of the complaint.

CIRCUIT PROTECTION

The purpose of circuit protection is to protect the wiring assembly during normal and overload conditions. An overload is defined as a current requirement that is higher than normal. The overload could be caused by a short circuit or system malfunction. The short circuit could be the result of a pinched or cut wire, or an internal device short circuit, such as an electronic module failure.

The circuit protection device is only applied to protect the wiring assembly, and not the electrical load at the end of the assembly. For example, if an electronic component short circuits, the circuit protection device will assure a minimal amount of damage to the wiring assembly. However, it will not necessarily prevent damage to the component.

CIRCUIT PROTECTION DEVICES

There are two basic types of circuit protection devices: Fuse, and Fusible Link.

FUSES

The most common method of automotive wiring circuit protection is the fuse (Figure 3-1). A fuse is a device that, by the melting of its element, opens an electrical circuit when the current exceeds a given level for a sufficient time. The action is non-reversible and the fuse must be replaced each time a circuit is overloaded or after a malfunction is repaired.

Fuses are color coded. The standardized color identification and ratings are shown in Figure 3-2. For service replacement, non-color coded fuses of the same respective current rating can be used.

Examine a suspect fuse for a break in the element. If the element is broken or melted, replace the fuse with one of equal current rating.

There are additional specific circuits with in-line fuses. These fuses are located within the individual wiring harness and will appear to be an open circuit if blown.

Autofuse

The Autofuse, normally referred to simply as "Fuse," is the most common circuit protection device in today's vehicle. The Autofuse is most often used to protect the wiring assembly between the Fuse Block and the system components.

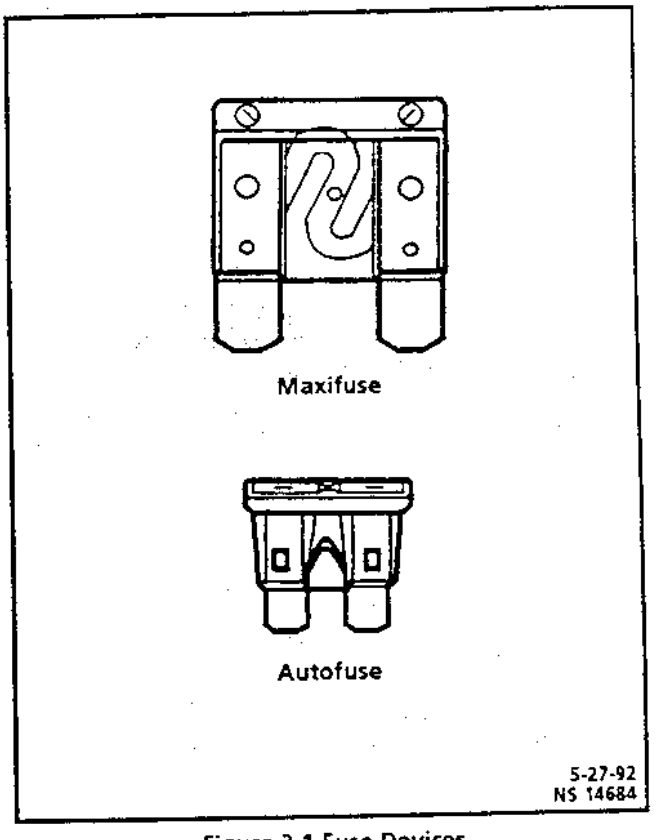


Figure 3-1 Fuse Devices

Maxifuse

The Maxifuse was designed to replace the fusible link. The Maxifuse is designed to protect cables, normally between the Battery and Fuse Block, from both direct short circuits and resistive short circuits.

Compared to a fusible link, the Maxifuse performs much more like an Autofuse, although the average opening time is slightly longer. This is because the Maxifuse was designed to be a slower blowing fuse, with less chance of nuisance blows.

Fusible Links

In addition to fuses, some circuits use fusible links to protect the wiring.

AUTOFUSE

CURRENT RATING	COLOR
3	VIOLET
5	TAN
7.5	BROWN
10	RED
15	BLUE
20	YELLOW
25	NATURAL
30	GREEN

MAXIFUSE

CURRENT RATING	COLOR
20	YELLOW
30	GREEN
40	AMBER
50	RED
60	BLUE
70	BROWN
80	NATURAL

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Figure 3-2 Fuse Rating and Color

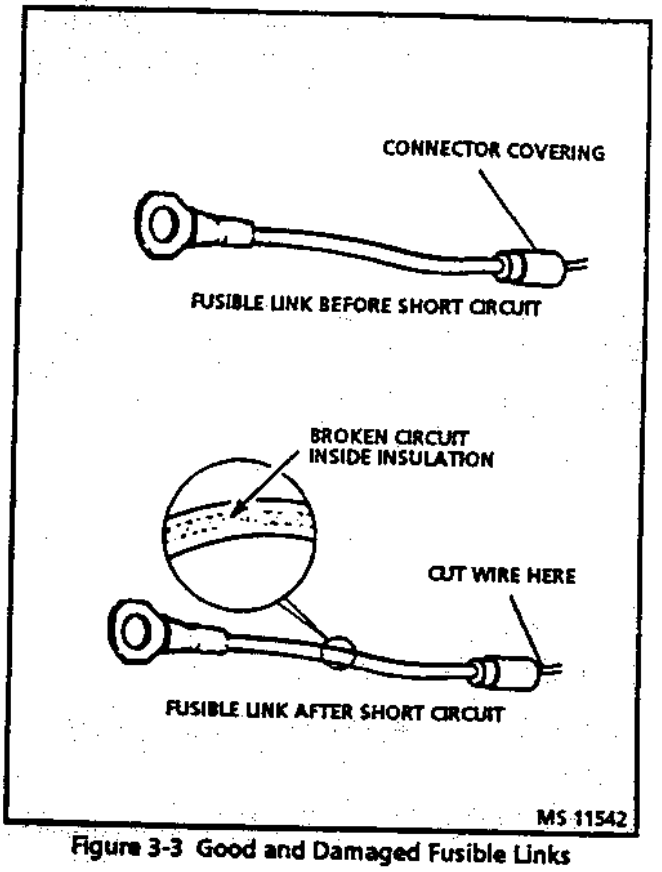

Figure 3-3 Good and Damaged Fusible Links

Like fuses, fusible links are "one-time" protection devices that will melt and create an open circuit (see Figure 3-3).

Not all fusible link open circuits can be detected by observation. Always inspect that there is battery voltage past the fusible link to verify continuity.

Each fusible link is four wire gauges smaller than the cable it is designed to protect.

Service fusible links are available in many lengths. Choose the shortest length that is suitable. If the fusible link is to be cut from a spool, it should be cut 150-225 mm long. NEVER make a fusible link longer than 225 mm.

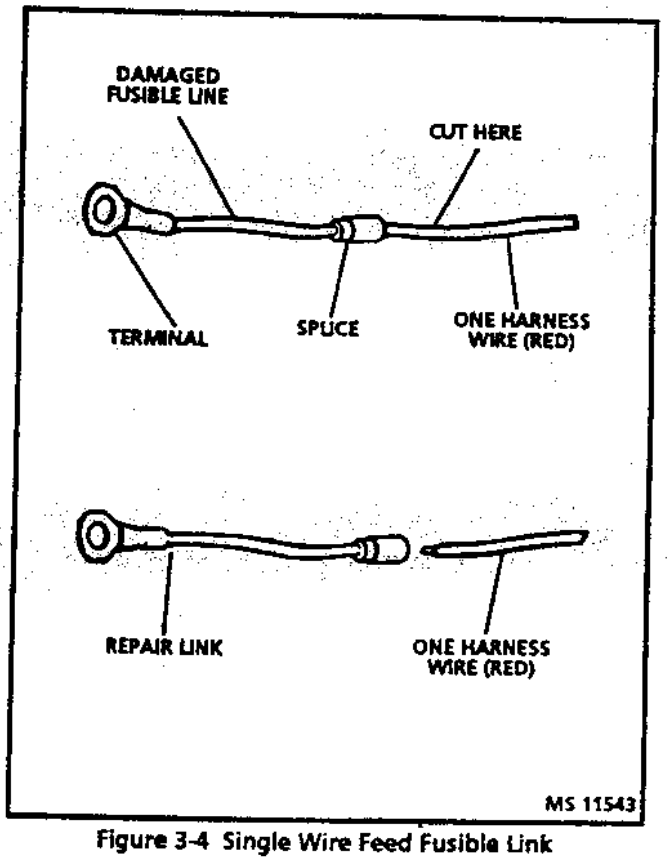

Figure 3-4 Single Wire Feed Fusible Link

CAUTION: Fusible links cut longer than 225 mm will not provide sufficient overload protection.

To replace a damaged fusible link (Figure 3-4), cut it off beyond the splice. Replace with a repair link. For splicing see "Splicing Copper Wire Using Splice Clips." To seal the splices do not use shrink tube with hot melt, there is special tubing required for fusible link applications. This special tubing is *not* included in Terminal Repair Kit J 39745. It is available, however, through Packard Electric and is referred to as "Heat Shrinking Dual Wall Tube." (ES M-2310 code 400, 500, 700.)

TYPICAL ELECTRICAL REPAIRS

An open circuit is an incomplete circuit. Power cannot reach the load or reach ground. If a circuit is open, active components do not energize. A short circuit is an unwanted connection between one part of the circuit and either ground or another part of the circuit. A short circuit causes a fuse to blow.

Short Circuits Caused By Damaged Wire Insulation

- Locate the damaged wire.
- Find and correct the cause of the wire insulation damage.

REPLACING TERMINALS ON UNSEALED COMPONENTS

Step 1:

Remove damaged terminal from the connector housing. To determine the correct removal tool to use, refer to the manual included in Terminal Repair Kit J 39745.

Step 2:

Cut off damaged terminal. Do not cut off unnecessary amounts of wire. Cut off as little as possible.

Step 3:

Remove wire insulation using the wire stripper provided in Terminal Repair Kit J 39745. Extreme caution must be used not to cut wire strands as the insulation is removed.

Step 4:

Select the correct replacement terminal (refer to Terminal Repair Kit J 39745) and position the strip in the terminal.

Step 5:

Using the correct crimp tool provided in Terminal Repair Kit J 39745, crimp the terminal. Solder all hand crimped terminals to ensure a clean, dry connection.

Step 6:

Plug the terminal into the connector housing. Be sure that the wires are plugged into the correct cavity. A properly seated terminal will "Click" when seated.

REPLACING PIGTAILS ON SEALED COMPONENTS

Pigtails are connectors with crimped wires. They are approximately 20 cm long. Pigtails are included in the Terminal Repair Kit J 39745 for all of the sealed components in the Engine Management System Wiring Harness.

Repair Procedure

Step 1:

Select the correct pigtail using the manual included in Terminal Repair Kit J 39745.

Step 2:

Cut off the damaged connector *not more than 20 cm* from the top of the connector.

Step 3:

Splice the new pigtail into the harness. To make a sealed splice see "Splicing Copper Wire Using Splice Clips, Shrink Tube and Hot Melt," included in Section 3 of this manual.

Be sure that the color of the pigtail is the same color as the wire on the wiring harness.

All pigtails are marked with a white dot so that the replaced component can be identified for service reasons.

Step 4:

If the sealed splices are not protected by conduit or tubing, wrap the splices with electrical tape to ensure a dry, clean connection.

REPLACING CONNECTOR HOUSINGS ON UNSEALED COMPONENTS

Step 1:

Remove damaged terminals from the connector housing. To determine the correct removal tool to use, refer to the manual included in Terminal Repair Kit J 39745.

Step 2:

Select the correct connector housing using the manual included in Terminal Repair Kit J 39745 as a guide.

Step 3:

Making sure that the terminals are indexed correctly, plug the terminals into the selected connector housing. Ensure that the wires are plugged into the correct cavity. A properly seated terminal will "Click" when seated.

SPLICING COPPER WIRE USING SPLICE CLIPS

Splice Clips are included in Terminal Repair Kit J 39745. The splice clip should only be used as a general purpose wire repair device.

It should only be used for applications in the passenger compartment that do not need special requirements such as moisture sealing.

Step 1: Open the Harness

If the harness is taped, remove the tape. If the harness has a black plastic conduit, simply pull out the desired wire.

Step 2: Cut the Wire

Begin by cutting as little wire off the harness as possible. You may need the extra length of the wire later if you decide to cut more wire off to change the location of a splice. You may have to adjust splice locations to make certain that each splice is at least 40 mm away from an outlet(s) and 65 mm from another splice.

Step 3: Strip the Insulation

When replacing a wire, use a wire of the same size as the original wire or larger. The schematics list wire size in metric units.

If you aren't sure of the wire size, start with the largest opening in the wire stripper and work down until a clean strip of the insulation is removed. Be careful to avoid nicking or cutting any of the wires.

Step 4: Crimp the Wires

Select the proper clip to secure the splice. To determine the proper clip size for the wire being spliced, see splice crimp matrix below.

SPLICE CRIMP MATRIX

SPLICE CLIP PART NUMBER	WIRE SIZE/MM²	
	1.0-2.49	2.5-5.0
12064904	x	
12064905		x

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Figure 3-5 Splice Crimp Matrix

To select the correct crimp tool consult the instructions included in the Terminal Repair Kit J 39745. Select the correct anvil on the crimper. On most crimpers your choice is limited to either a small or large anvil. Overlap the stripped wire ends and hold them between your thumb and forefinger as shown in Figure 3-6. Then, center the splice clip under the stripped wires and hold it in place.

- Open the crimping tool to its full width and rest one handle on a firm flat surface.
- Center the back of the splice clip on the proper anvil and close the crimping tool to the point where the former touches the wings of the clip.
- Make sure that the clip and wires are still in the correct position. Then, apply steady pressure until the crimping tool closes.

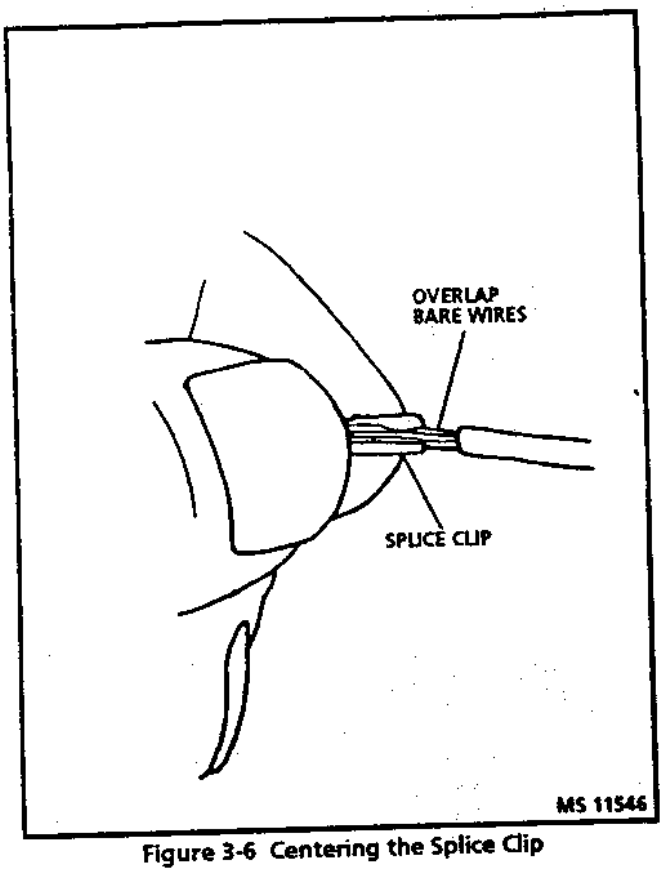

Figure 3-6 Centering the Splice Clip

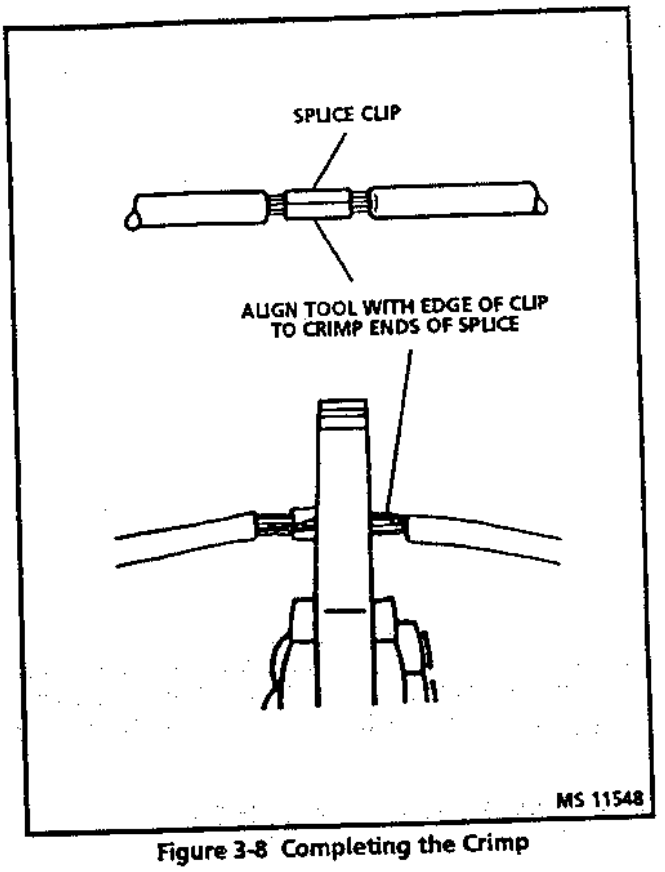

Figure 3-8 Completing the Crimp

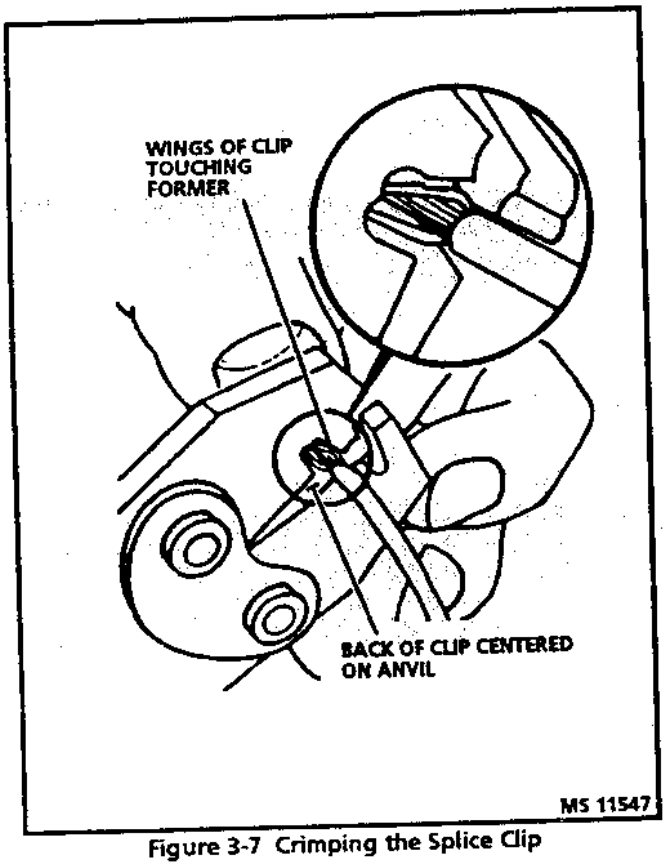

Figure 3-7 Crimping the Splice Clip

- Before crimping the ends of the clip, be sure that:
  - The wires extend beyond the clip in each direction.
  - No strands of wire are cut loose, and
  - No insulation is caught under the clip.

Crimp the splice again, once on each end. Do not let the crimping tool extend beyond the edge of the clip or you may damage or nick the wires (Figure 3-8).

Step 5: Solder

Apply 60/40 rosin core solder to the opening in the back of the clip (see Figure 3-9). Follow the manufacturer's instruction for the solder equipment you are using.

Step 6: Tape the Cable

Center and roll the splicing tape. The tape should cover the entire splice. Roll on enough tape to duplicate the thickness of the insulation on the existing wires. Do not flag the tape. Flagged tape may not provide enough insulation, and the flagged ends will tangle with the other wires in the harness (see Figure 3-10).

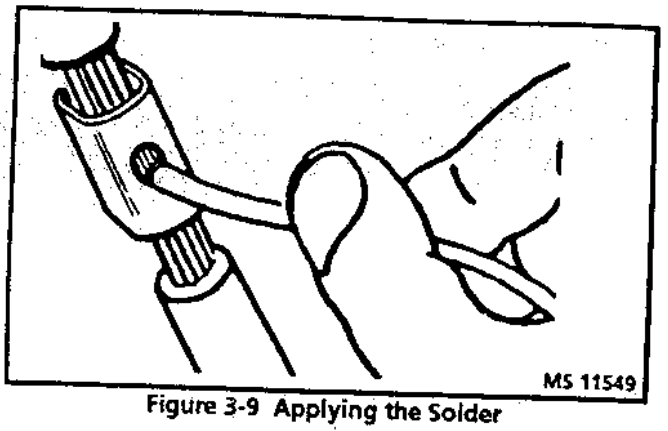

Figure 3-9 Applying the Solder

If the wire does not belong in a conduit or other harness covering, tape the wire again. Use a winding motion to cover the first piece of tape (Figure 3-11).

SPLICING COPPER WIRE USING SPLICE CLIP, SHRINK TUBE AND HOT MELT

For applications in the engine compartment it is necessary to have sealed splices because of the potential of moisture invading the splice. Splice clips, shrink tube and hot melt are included in Terminal Repair Kit J 39745.

Step 1: Open the Harness

If the harness is taped, remove the tape. If the harness has a block plastic conduit, simply pull out the wire.

Step 2: Cut the Wire

Begin by cutting as little wire off the harness as possible. You may need the extra length of wire later if you decide to cut more wire to change the location of a splice. You may have to adjust splice locations to make certain that each splice is at least 40 mm away from an outlet(s) and 65 mm away from other splices.

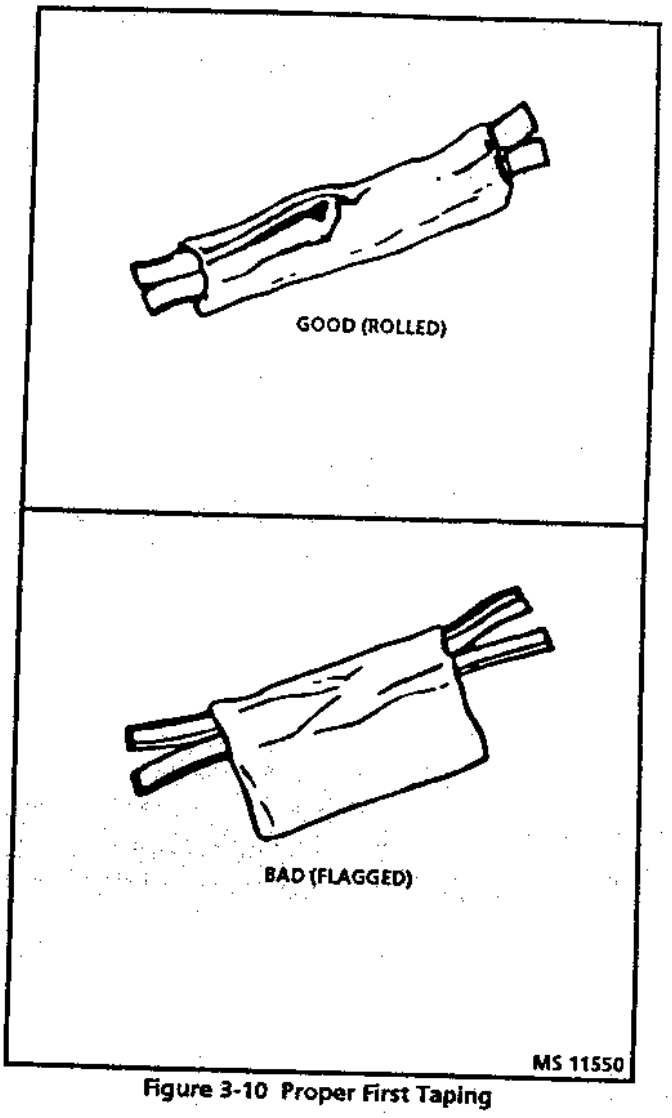

Figure 3-10 Proper First Taping

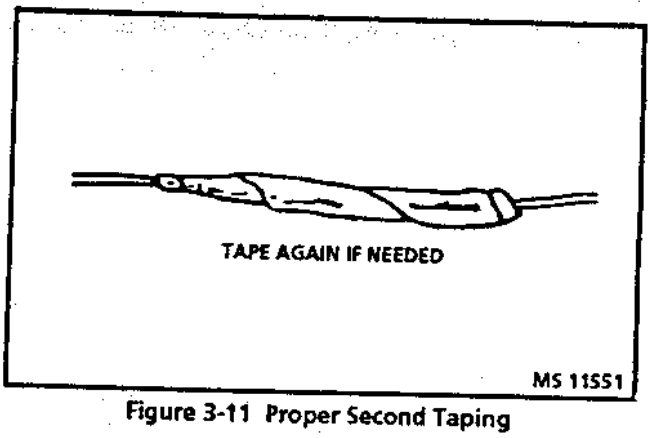

Figure 3-11 Proper Second Taping

This will help prevent moisture from bridging adjacent splices and causing damage.

Step 3: Strip the Insulation

When replacing a wire, use a wire of the same size as the original wire or larger. The schematics list wire size in metric units.

If you aren't sure of the wire size, start with the largest opening in the wire stripper and work down until a clean strip of the insulation is removed. Be careful to avoid nicking or cutting any of the wires.

Step 4: Crimp the Wires

Remove the appropriate size shrink tube from Terminal Repair Kit J 39745 and slip it over the end of the wire. Select the proper clip to secure the splice. To determine the proper clip size for the wire being spliced, see splice crimp matrix below.

SPLICE CRIMP MATRIX

SPLICE CLIP PART NUMBER	WIRE SIZE/MM²	
	1.0-2.49	2.5-5.0
12064904	x	
12064905		x

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Figure 3-12 Splice Crimp Matrix

To select the correct crimp tool consult the instructions included in the Terminal repair kit J 39745. Select the correct anvil on the crimper. On most crimpers your choice is limited to either a small or large anvil. Overlap the stripped wire ends and hold them between your thumb and forefinger as shown in Figure 3-6. Then, center the splice clip under the stripped wires and hold it in place.

- Open the crimping tool to its full width and rest one handle on a firm flat surface.
- Center the back of the splice clip on the proper anvil and close the crimping tool to the point where the former touches the wings of the clip.
- Make sure that the clip and wires are still in the correct position. Then, apply steady pressure until the crimping tool closes.
- Before crimping the ends of the clip, be sure that:
  - The wires extend beyond the clip in each direction.
  - No strands of wire are cut loose, and
  - No insulation is caught under the clip.

Crimp the splice again, once on each end. Do not let the crimping tool extend beyond the edge of the clip or you may damage or nick the wires (Figure 3-8).

Step 5: Solder

Apply 60/40 rosin core solder to the opening in the back of the clip (see Figure 3-9). Follow the manufacturer's instruction for the solder equipment you are using.

Step 6: Shrink Tube/Hot Melt

Shrink tube should now be applied to ensure that the splice remains clean and dry. Position the proper size shrink tube so that the splice clip and any bare copper wire is covered. Lay several pieces of hot melt under the shrink tube as close as possible to the middle of the splice. Shrink tube and hot melt are available in Terminal Repair Kit J 39745.

Step 7: Apply Heat

Using an appropriate low heat source, apply heat to the shrink tube. Be extremely careful not to position the heat source too close to the shrink tube, it will melt if overexposed to heat.

After a few seconds of moderate heat the shrink tube will melt and a small amount of hot melt will come out the end of the tube. The shrink tube will conform to the splice providing a clean, dry seal.

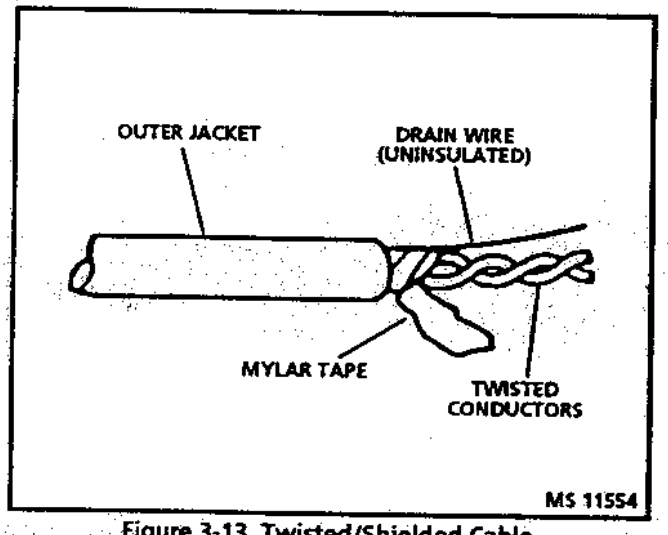


Figure 3-13 Twisted/Shielded Cable

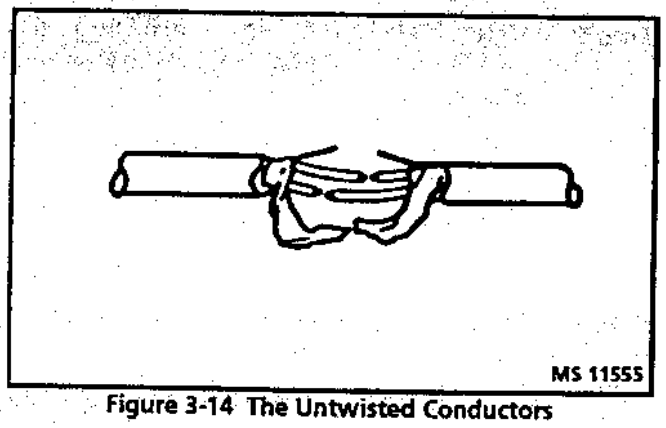


Figure 3-14 The Untwisted Conductors

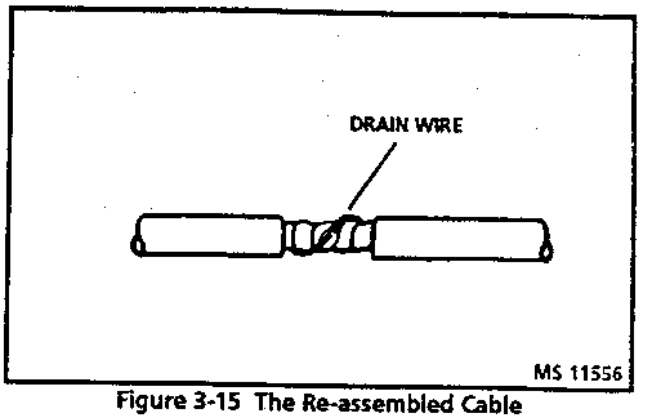


Figure 3-15 The Re-assembled Cable

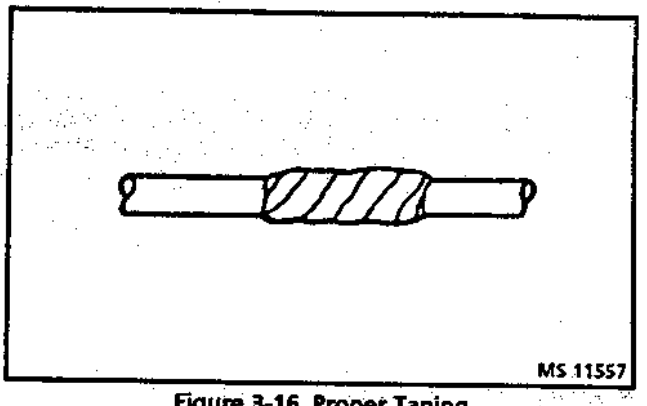


Figure 3-16 Proper Taping

SPLICING TWISTED/SHIELDED CABLE

Twisted/shielded cable is sometimes used to protect wiring from electrical noise (stray signals). For example, two-conductor cable of this construction is used between the electronic control module and the ignition module. See Figure 3-13 for a breakdown of twisted/shielded cable construction.

Step 1: Remove Outer Jacket

Remove the outer jacket and discard it. Be careful to avoid cutting into the drain wire or the mylar tape.

Step 2: Unwrap the Tape

Unwrap the aluminum/mylar tape, but do not remove it. The tape will be used to rewrap the twisted conductors after the splices have been made.

Step 3: Prepare the Splice

Untwist the conductors. Then, prepare the splice by following the splicing instructions for copper wire presented earlier. Remember to stagger splices to avoid shorts (Figure 3-14).

Step 4: Re-assemble the Cable

After you have spliced and taped each wire, rewrap the conductors with the mylar tape. Be careful to avoid wrapping the drain wire in the tape.

Next, splice the drain wire following the splicing instructions for copper wire. Then, wrap the drain wire around the conductors and mylar tape (Figure 3-15).

Step 5: Tape the Cable

Tape over the entire cable using a winding motion (see Figure 3-16). This tape will replace the section of the jacket you removed to make the repair.

REPAIRING CONNECTORS

- The following general repair procedures can be used to repair most types of connectors. The repair procedures are divided into three general groups: Push-to-Seat and Pull-to-Seat and Weather Pack®.
- See "Terminal Repair Kit Instruction Manual," (J 39745) to determine which type of connector is to be serviced.
- Use the proper Pick(s) or Tool(s) that apply to the terminal.

PUSH-TO-SEAT AND PULL-TO-SEAT

Follow the steps below to repair Push-to-Seat (Figure 3-17) or Pull-to-Seat (Figure 3-18) connectors. The steps are illustrated with typical connectors. Your connector may differ, but the repair steps are similar. Some connectors do not require all the steps shown. Skip those that don't apply.

Step 1: Remove any connector position assurance locks. Connector position assurances are designed to retain connectors when mated.

Step 2: Remove any terminal position assurance Locks. Terminal position assurances are designed to keep the terminal from backing out of the connector.

NOTICE: The terminal position assurance must be removed prior to terminal removal and must be replaced when the terminal is repaired and reseated.

Step 3: Open any secondary locks. A secondary lock aids in terminal retention and is usually molded to the connector.

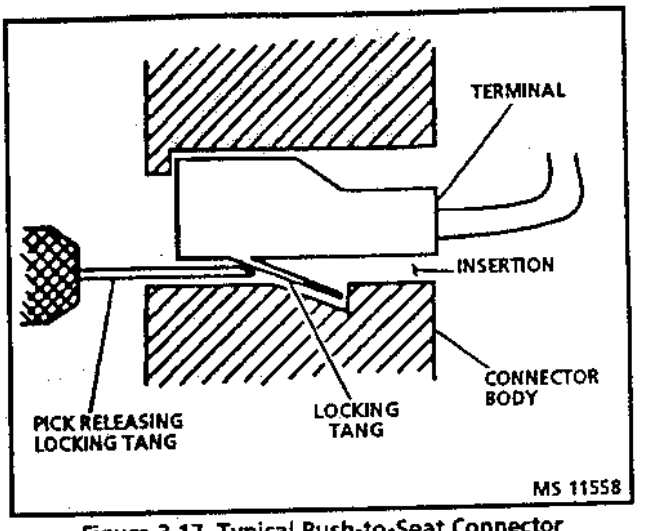


Figure 3-17 Typical Push-to-Seat Connector and Terminal

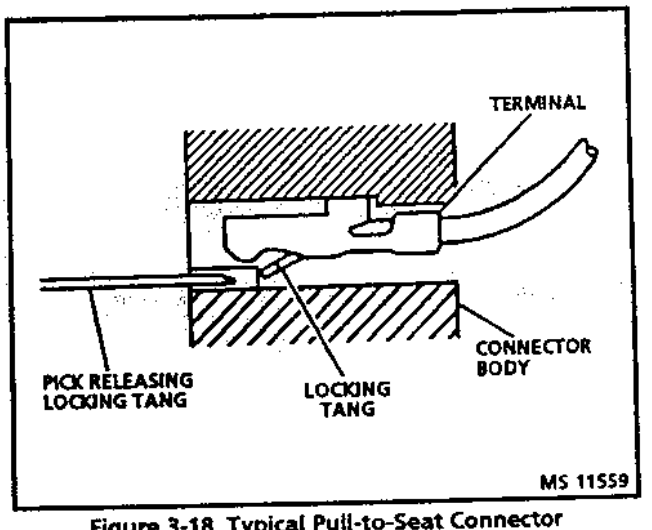


Figure 3-18 Typical Pull-to-Seat Connector and Terminal

Step 4: Separate the connector halves and back out seals.

Step 5: Grasp the lead and push the terminal to the forward most position. Hold the lead at this position.

Step 6: Locate the terminal lock tang in the connector canal.

Step 7: Insert the proper size pick (refer to Terminal Repair Kit J 39745) straight into the connector canal at the mating end of the connector.

Step 8: Depress the locking tang to unseat the terminal.

Push-to-Seat - Gently pull on the lead to remove the terminal through the back of the connector.

Pull-to-Seat - Gently push on the lead to remove the terminal through the front of the connector.

NOTICE: Never use force to remove a terminal from a connector.

Step 9: Inspect terminal and connector for damage. Repair as necessary.

Step 10: Reform lock tang and reseat terminal in connector body. Apply grease if connector was originally equipped with grease.

Step 11: Install any connector position assurances or terminal position assurances, close any secondary locks and join connector halves.

WEATHER PACK

Follow the steps below to repair Weather Pack® connectors (Figure 3-19).

Step 1: Separate the connector halves.

Step 2: Open secondary lock. A secondary lock aids in terminal retention and is usually molded to the connector.

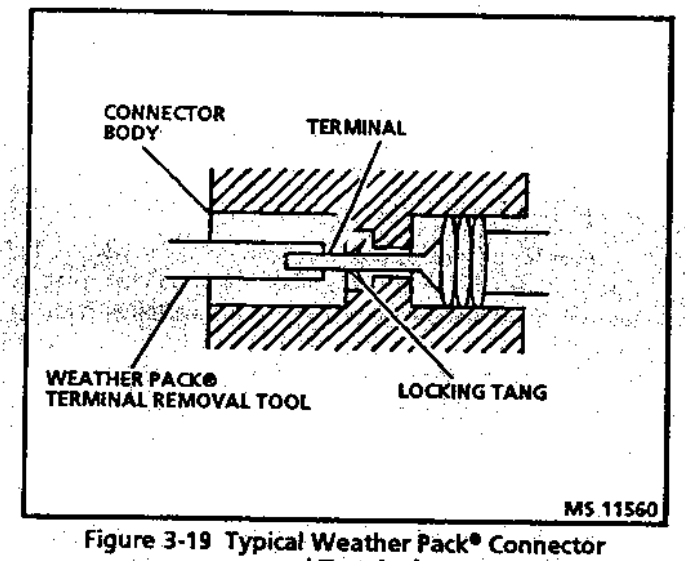


Figure 3-19 Typical Weather Pack® Connector and Terminal

Step 3: Grasp the lead and push the terminal to the forward most position. Hold the lead at this position.

Step 4: Insert the Weather Pack® terminal removal tool into the front (mating end) of the connector cavity until it rests on the cavity shoulder.

Step 5: Gently pull on the lead to remove the terminal through the back of the connector.

NOTICE: Never use force to remove a terminal from a connector.

Step 6: Inspect the terminal and connector for damage. Repair as necessary (see "Terminal Repair," on following page).

Step 7: Reform the lock tang and reseat terminal in connector body.

Step 8: Close secondary locks and join connector halves.

TERMINAL REPAIR

The following repair procedures can be used to repair Push-to-Seat, Pull-to-Seat or Weather Pack® terminals (Figure 3-20). Some terminals do not require all steps shown. Skip those that don't apply. The Terminal Repair Kit (J 39745) contains additional information.

Step 1: Cut off terminal between core and insulation crimp (minimize wire loss) and remove seal for Weather Pack® terminals.

Step 2: Apply correct seal per gauge size of wire and slide back along wire to enable insulation removal (Weather Pack® terminals only).

Step 3: Remove insulation.

Step 4: Align seal with end of cable insulation (Weather Pack® terminals only).

Step 5: Position strip (and seal for Weather Pack®) in terminal.

Step 6: Hand crimp core wings.

Step 7: Hand crimp insulation wings (non-Weather Pack®). Hand crimp insulation wings around seal and cable (Weather Pack®).

Step 8: Solder all hand crimped terminals.

WIRING CONNECTOR SERVICE

Most connectors in the engine compartment are protected against moisture and dirt which could create oxidation and deposits on the terminals. This protection is important because of the very low voltage and current levels found in the electronic system. The connectors have a lock which secures the male and female terminals together. A secondary lock holds the seal and terminal into the connector.

When diagnosing, open circuits are often difficult to locate by sight because oxidation or terminal misalignment are hidden by the connectors. Merely wiggling a connector on a sensor or in the wiring harness may locate the open circuit condition.

This should always be considered when an open circuit or failed sensor is indicated. Intermittent problems may also be caused by oxidized or loose connections.

Before making a connector repair, be certain of the type of connector. Weather-Pack and Compact Three connectors look similar but are serviced differently.

Metri-Pack Series 150 Terminals

Some electronic control module harness connectors contain terminals called Metri-Pack (see Figure 3-21). These are used at the coolant temperature sensor.

Metri-Pack terminals are also called "Pull-to-Seat" terminals because to install a terminal on a wire, the wire is first inserted through the seal and connector. The terminal is then crimped on the wire, and the terminal pulled back into the connector to seat it in place.

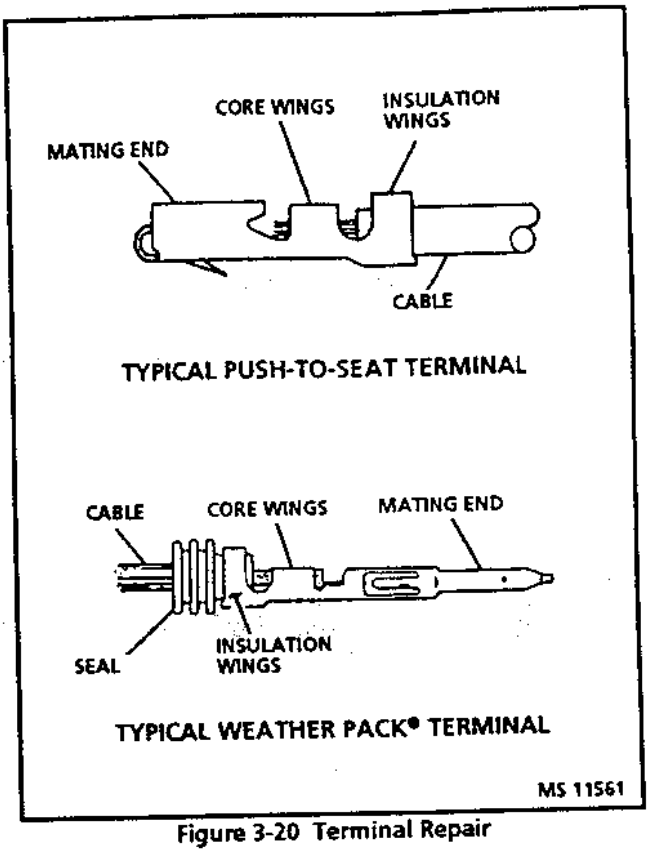


Figure 3-20 Terminal Repair

To remove a terminal:

1. Slide the seal back on the wire.
2. Insert tool as shown in Figure 3-21 insert "A", to release the terminal locking tang.

Weather-Pack Connectors

Figure 3-22 shows a Weather-Pack connector and the tool required to service it. This tool is used to remove the pin and sleeve terminals. If terminal removal is attempted with an ordinary pick, there is a good chance that the terminal will be bent or deformed, and unlike standard blade type terminals, these terminals cannot be straightened once they are bent.

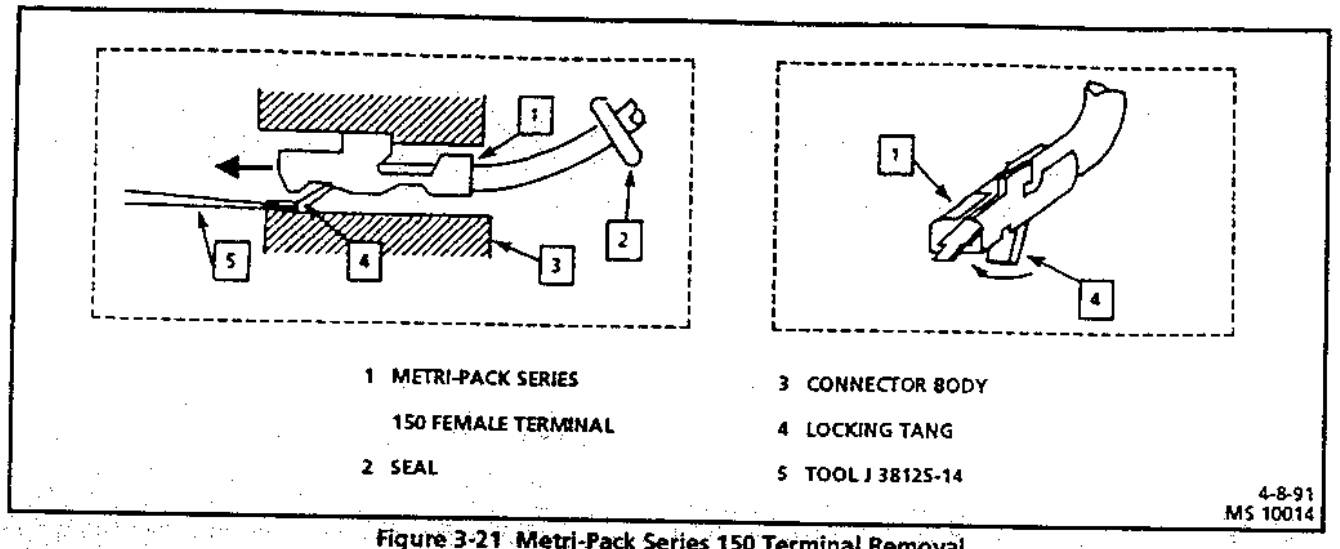


Figure 3-21 Metri-Pack Series 150 Terminal Removal

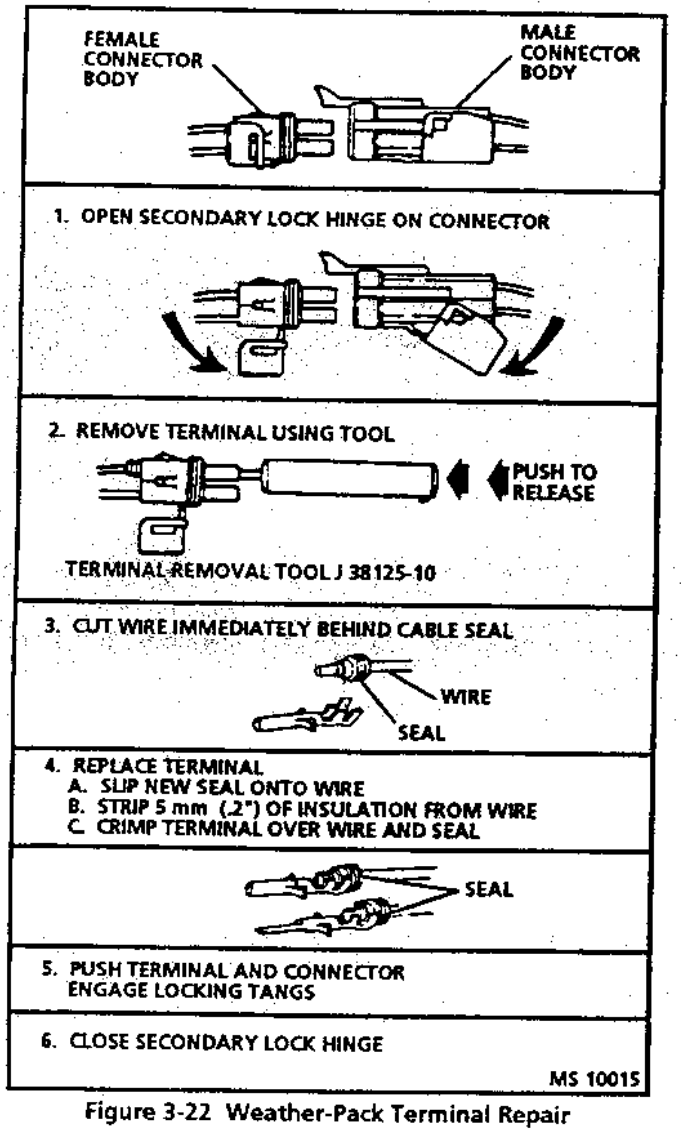

FEMALE CONNECTOR BODY
MALE CONNECTOR BODY
1. OPEN SECONDARY LOCK HINGE ON CONNECTOR
2. REMOVE TERMINAL USING TOOL
PUSH TO RELEASE
TERMINAL REMOVAL TOOL J 38125-10
3. CUT WIRE IMMEDIATELY BEHIND CABLE SEAL
WIRE
SEAL
4. REPLACE TERMINAL
A. SLIP NEW SEAL ONTO WIRE
B. STRIP 5 mm (.2") OF INSULATION FROM WIRE
C. CRIMP TERMINAL OVER WIRE AND SEAL
SEAL
5. PUSH TERMINAL AND CONNECTOR ENGAGE LOCKING TANGS
6. CLOSE SECONDARY LOCK HINGE
MS 10015

Figure 3-22 Weather-Pack Terminal Repair

Make certain that the connectors are properly seated and all of the sealing rings in place when connecting leads. The hinge-type flap provides a secondary locking feature for the connector. It improves the connector reliability by retaining the terminals if the small terminal lock tangs are not positioned properly.

Weather-Pack connections cannot be replaced with standard connections. Instructions are provided with Weather-Pack connector and terminal packages.

Compact Three Connectors

The Compact Three connector, which looks similar to a Weather-Pack connector, is not sealed and is used where resistance to the environment is not required. Use the standard method when repairing a terminal.

Micro-Pack Connectors

Micro-Pack terminal (see Figure 3-23) replacement requires the use of the special tool shown.

TOOLS NEEDED TO SERVICE THE SYSTEM

The system requires a Tech 1 "Scan" tool, test light, ohmmeter, digital voltmeter with 10 megohms impedance, vacuum gage and jumper wires for diagnosis. A test light or voltmeter must be used when specified in the procedures (Figure 3-24). See Section 6 - Special Tools needed to diagnose or repair a system. For more complete information on the operation of these tools, consult the tool manufacturer's instructions.

WIRING HARNESS SERVICE

To meet GM engineering repair standards, use Terminal Repair Kit, J 39745, to repair wiring and replace connectors. The kit includes crimping tools, hardware, terminal removal tools, heat torch and instruction manual. Wire harnesses should be replaced with proper part number harnesses. When signal wires are spliced into a harness, use wire with high temperature insulation only. See Figure 3-25 for instructions.

With the low current and voltage levels found in the system, it is important that the best possible bond be made at all wire splices by soldering the splices as shown.

Use care when probing a connector or replacing connector terminals. It is possible to short between opposite terminals. If this happens, certain components can be damaged. Always use fused jumper wires between connectors for circuit checking. **NEVER** probe through connector seals, wire insulation, secondary ignition wires, boots, nipples, or covers. Even microscopic damage or holes may result in eventual water intrusion, corrosion and/or component or circuit failure.

CHECKING TERMINAL CONTACT

When diagnosing an electrical system that utilizes Metri-Pack 150/280/480 series terminals (refer to Terminal Repair Kit J 39745 instruction manual for terminal identification), it is important to check terminal contact between a connector and component, or between in-line connectors, before replacing a suspect component. This is especially true for the Metri-Pack 150 series female terminal.

Frequently, a diagnostic chart leads to a step that reads: "Check for poor connection or replace...." Replacing a component may, at best, temporarily cure a connection problem. Eventually the connection will weaken and cause a repeat failure. Mating terminals must be inspected to assure good terminal contact or correct a poor connection. Poor connection between the male and female terminal at a connector is the result of contamination or deformation.

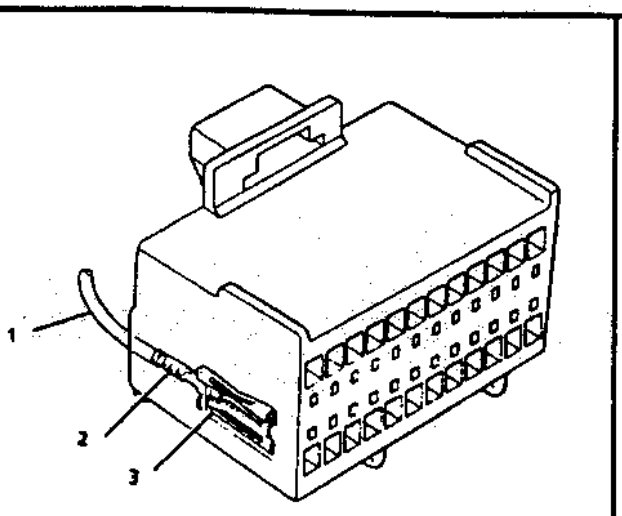
Contamination is caused by the connector halves being improperly joined, a missing or damaged connector seal, or damage to the connector itself, exposing the terminals to moisture and dirt. Contamination, usually to underhood or underbody connectors, leads to terminal corrosion, causing an open circuit or intermittently open circuit.

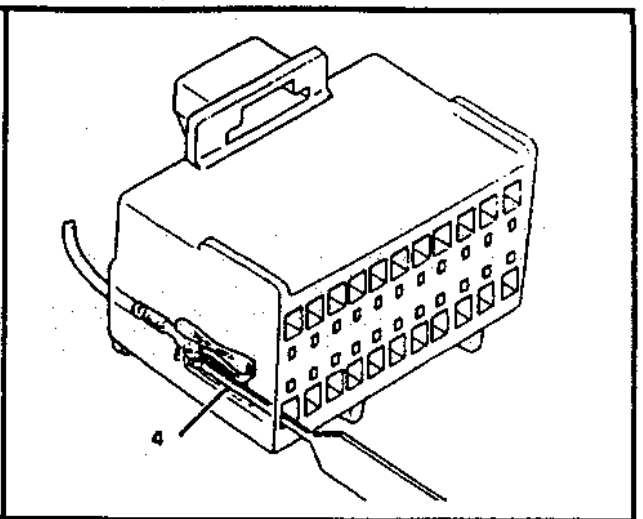
Deformation is caused by probing the mating side of a connector terminal without the proper adapter, improperly joining the connector halves or repeatedly separating and joining the connector halves. Deformation, usually to the female terminal contact tang, can result in poor terminal contact causing an open or intermittently open circuit.

Follow the procedure below to check terminal contact.

1. Separate the connector halves, refer to Terminal Repair Kit J 39745 instruction manual.
2. Inspect the connector halves for contamination. Contamination will result in a white or green build-up within the connector body or between terminals, causing high terminal resistance, intermittent connection or an open circuit. An underhood or underbody connector that shows signs of contamination should be replaced in its entirety, terminals, seals and connector body.
3. Using an equivalent male terminal from the Terminal Repair Kit J 39745, check the retention force of the female terminal in question by inserting and removing the male terminal to the female terminal in the connector body. Good terminal contact will require a certain amount of force to separate the terminals.
4. Using an equivalent female terminal from the Terminal Repair Kit J 39745, compare the retention force of this terminal to the female terminal in question by joining and separating the male terminal to the good female terminal, and then joining and separating the male terminal to the female terminal in question. If the retention force is significantly different between the two female terminals, replace the female terminal in question, refer to Terminal Repair Kit J 39745.
5. Push the wire and terminal out through the connector.

If the terminal is being reused, reshape the locking tang.



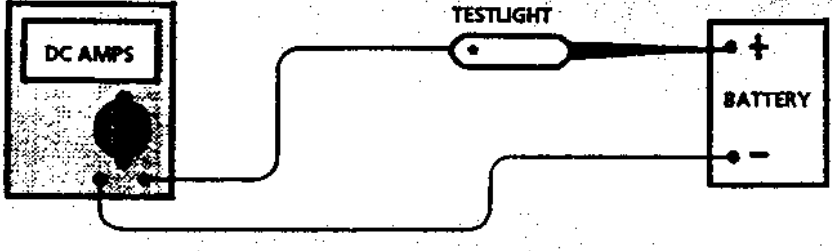


1 CABLE
2 TERMINAL
3 LOCKING TANG
4 TOOL J 38125-12

1. GRASP CABLE AND PUSH TERMINAL TO THE MOST FORWARD POSITION.
2. INSERT TOOL J 38125-12 STRAIGHT INTO THE FRONT OF THE CONNECTOR CAVITY. DO NOT USE CONVENTIONAL PICK TO REMOVE TERMINAL.
3. WITH TOOL IN PLACE, GENTLY PULL ON THE CABLE TO REMOVE TERMINAL.
4. VISUALLY CHECK TERMINAL AND REPLACE IF TERMINAL CAVITY OR TANG IS DAMAGED.
5. INSTALL TERMINAL INTO CONNECTOR CAVITY UNTIL LOCKING TANG HAS SNAPPED INTO POSITION.

MS 10016-6E

Figure 3-23 Micro-Pack Terminal Replacement



If the ammeter indicates ***less*** than 1/4 amp current flow (.25a or 250 ma), the testlight is ***safe*** to use.

If the ammeter indicates ***more*** than 1/4 amp current flow (.25a or 250 ma), the testlight is ***not safe*** to use.

5-27-92
NS 14681

Figure 3-24 Test Light Check

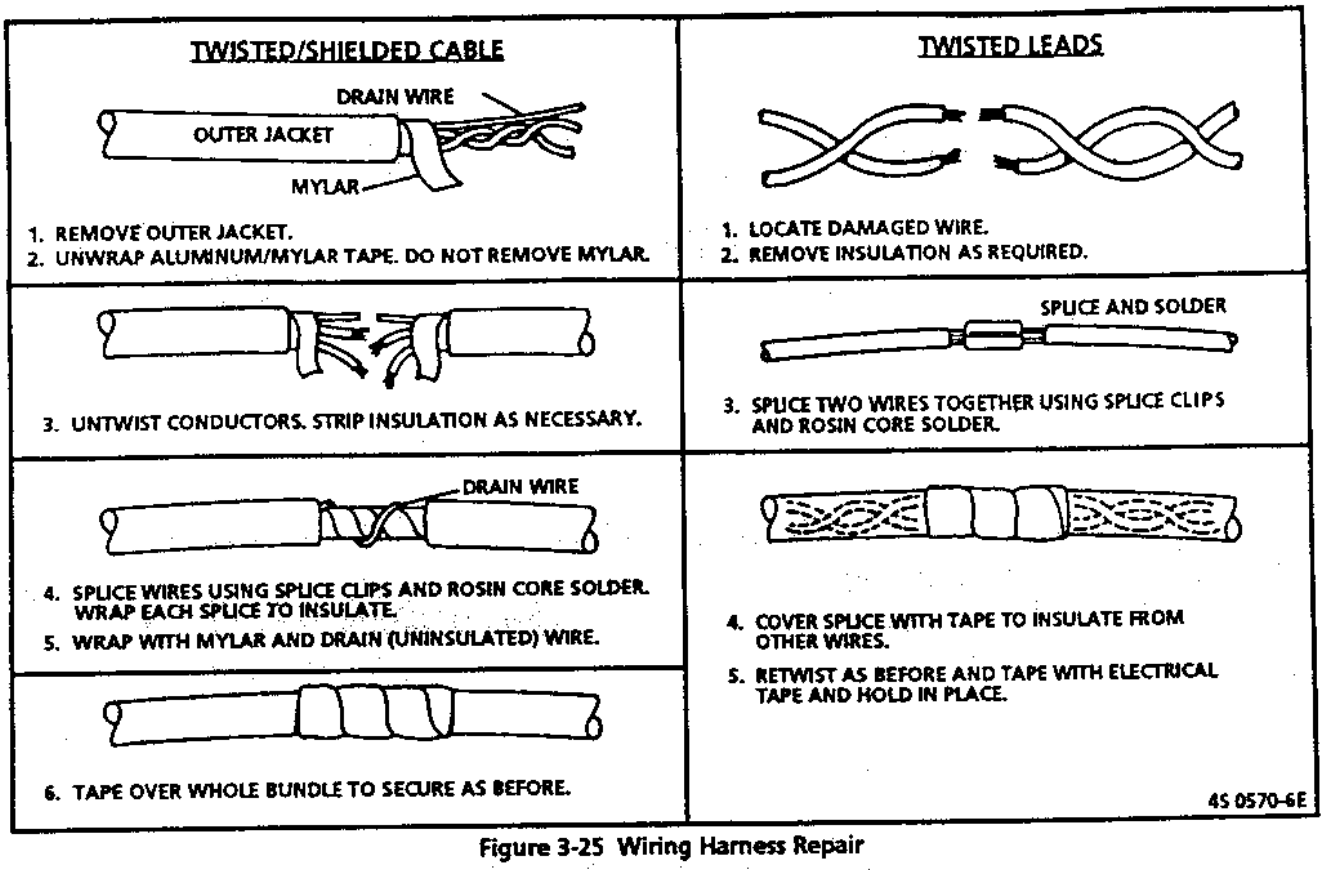

TWISTED/SHIELDED CABLE
DRAIN WIRE
OUTER JACKET
MYLAR
1. REMOVE OUTER JACKET.
2. UNWRAP ALUMINUM/MYLAR TAPE. DO NOT REMOVE MYLAR.
3. UNTWIST CONDUCTORS. STRIP INSULATION AS NECESSARY.
DRAIN WIRE
4. SPLICE WIRES USING SPLICE CLIPS AND ROSIN CORE SOLDER. WRAP EACH SPLICE TO INSULATE.
5. WRAP WITH MYLAR AND DRAIN (UNINSULATED) WIRE.
6. TAPE OVER WHOLE BUNDLE TO SECURE AS BEFORE.
TWISTED LEADS
1. LOCATE DAMAGED WIRE.
2. REMOVE INSULATION AS REQUIRED.
SPLICE AND SOLDER
3. SPLICE TWO WIRES TOGETHER USING SPLICE CLIPS AND ROSIN CORE SOLDER.
4. COVER SPLICE WITH TAPE TO INSULATE FROM OTHER WIRES.
5. RETWIST AS BEFORE AND TAPE WITH ELECTRICAL TAPE AND HOLD IN PLACE.
4S 0570-6E

Figure 3-25 Wiring Harness Repair

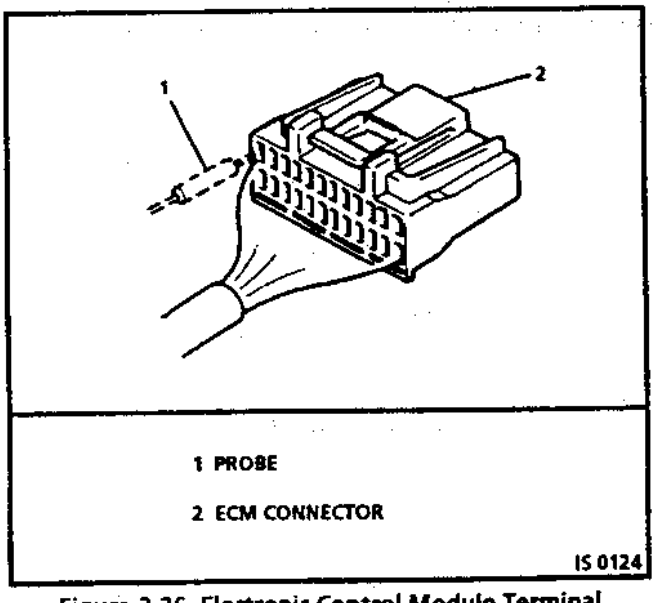


Figure 3-26 Electronic Control Module Terminal Probe Technique

3.1 ELECTRONIC CONTROL MODULE AND SENSORS

ELECTRONIC CONTROL MODULE

If the diagnostic procedures call for the electronic control module to be replaced, the engine calibrator and electronic control module should be checked first to see if they are the correct parts. If they are, remove the engine calibrator from the faulty electronic control module and install it in the new service electronic control module. THE SERVICE electronic control module WILL NOT CONTAIN AN engine calibrator. Code 61 indicates the engine calibrator is installed improperly or has malfunctioned. When Code 51 is obtained, check the engine calibrator installation for bent pins or pins not fully seated in the socket. If the engine calibrator is installed correctly and Code 51 still shows, replace the engine calibrator.

LOCATION: Driver's side of vehicle, behind kick panel.

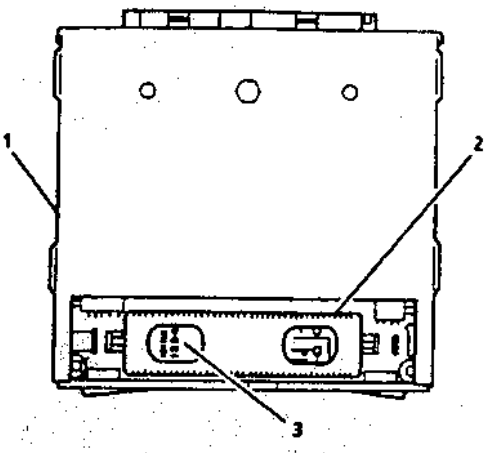
Important

- When replacing the production electronic control module with a service electronic control module, it is important to transfer the calibrator identification and production electronic control module number to the service electronic control module label (see Figure 3.1-1). Please do not record on electronic control module cover. This will allow positive identification of electronic control module parts throughout the service life of the vehicle.

  NOTICE: To prevent internal electronic control module damage, the ignition must be "OFF" when disconnecting or reconnecting power to electronic control module (for example, battery cable, electronic control module pigtail, electronic control module fuse, jumper cables, etc.).

Remove or Disconnect

1. Negative battery cable.
2. Driver's kick panel.
3. Electronic control module from bracket and connectors. (See Figure 3.1-2.)
4. Engine calibrator access cover. (See Figure 3.1-3.)
5. Engine calibrator from electronic control module.



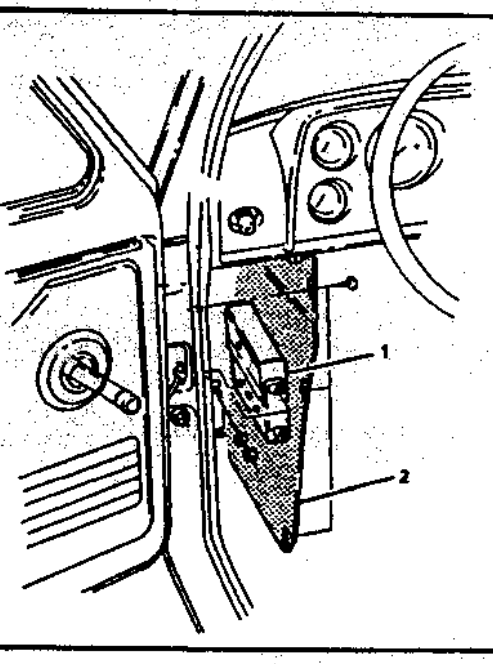
1 ELECTRONIC CONTROL MODULE

2 CALIBRATOR

3 CALIBRATOR IDENTIFICATION

NS 14510

Figure 3.1-1 Calibrator Identification



1 ELECTRONIC CONTROL MODULE

2 KICK PANEL

NS 13182

Figure 3.1-2 Electronic Control Module Location View

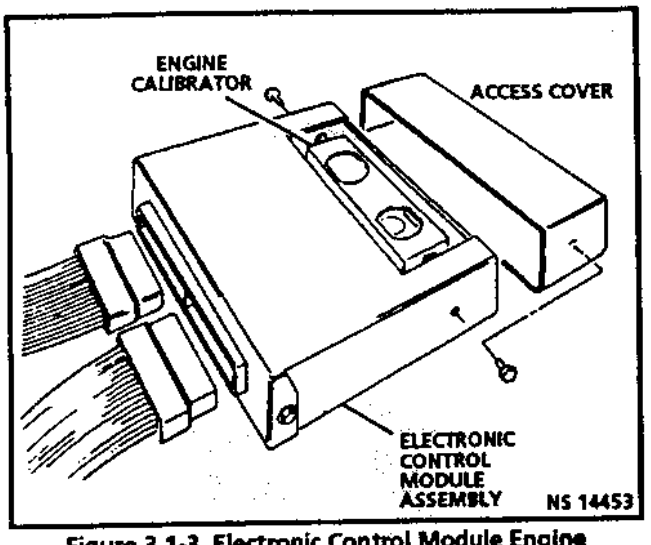


Figure 3.1-3 Electronic Control Module Engine Calibrator Access Cover

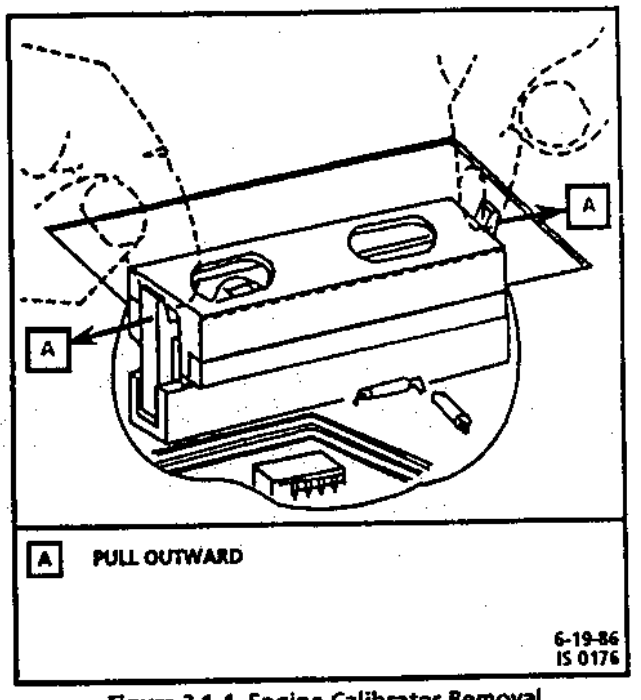


Figure 3.1-4 Engine Calibrator Removal

Important

- Replacement electronic control module is supplied without a memory-calibration unit (engine calibrator) so care should be taken when removing the engine calibrator (See Figure 3.1-4) from the defective electronic control module as it will be reused in the new electronic control module.
- Using two fingers, push both retaining clips back away from the engine calibrator at the same time (See Figure 3.1-4). Grasp the engine calibrator at both ends and lift up out of the engine calibrator socket. Do not remove the cover of the engine calibrator. Use of unapproved engine calibrator removal methods will cause damage to the engine calibrator or engine calibrator socket.

Inspect

- For alignment notches of the engine calibrator and carefully set aside. Do not open the engine calibrator.
- Compare new electronic control module service number to defective electronic control module to ensure correct part replacement.
- The engine calibrator to determine if a cork spacer is glued to the top side of the engine calibrator assembly. If yes, remove it prior to installation.

Install or Connect

1. Old engine calibrator in new electronic control module.

Important

- Align the small notches with matching notches in the electronic control module's engine calibrator socket.

  VERY GENTLY press down on the ends of the engine calibrator until the locking levers are rotated toward the sides of the engine calibrator. (Figure 3.1-5.)

NOTICE: To avoid electronic control module damage, DO NOT press on the ends of the engine calibrator until the levers snap into place. DO NOT use any vertical force beyond the minimum required to engage the engine calibrator into its socket.

  While continuing light pressure on the ends of the engine calibrator, use your index fingers to press the locking levers inward until they are snapped into place. Listen for the click.

2. Engine calibrator cover.
3. Electronic control module into vehicle.
4. Connectors.
5. Driver's kick panel.
6. Negative battery cable.

ENGINE CALIBRATOR

Code 51 indicates a faulty engine calibrator, bent pins, or incorrect installation.

Important

- The engine calibrator is "keyed" to prohibit improper insertion. However, it is essential that the correct engine calibrator be used with a specific model.

NOTICE: The ignition should always be "OFF" when installing or removing the electronic control module connectors.

LOCATION: Under access cover of electronic control module. (Figure 3.1-3).

Remove or Disconnect

1. Negative battery cable.
2. Driver's kick panel.
3. Electronic control module mounting hardware.
4. Connectors from electronic control module.
5. Electronic control module from passenger compartment.
6. Electronic control module access cover.
7. Remove engine calibrator assembly. (Figure 3.1-4).

Inspect

- The engine calibrator to determine if a cork spacer is glued to the top side of the engine calibrator assembly. If yes, remove it prior to installation.

Install or Connect

1. Old engine calibrator in new electronic control module.

Important

- Align the small notches with matching notches in the electronic control module's engine calibrator socket.

VERY GENTLY press down on the ends of the engine calibrator until the locking levers are rotated toward the sides of the engine calibrator. (Figure 3.1-5).

NOTICE: To avoid electronic control module damage, DO NOT press on the ends of the engine calibrator until the levers snap into place. DO NOT use any vertical force beyond the minimum required to engage the engine calibrator into its socket..

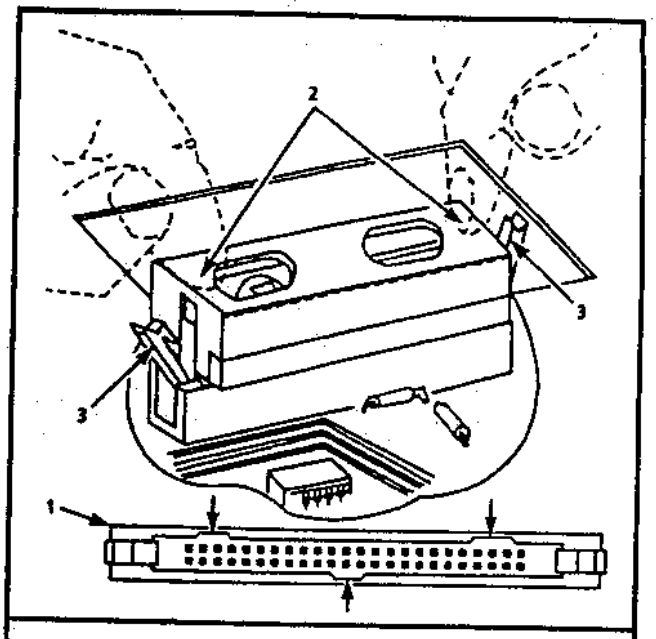


Figure 3.1-5 Engine Calibrator Installation

While continuing light pressure on the ends of the engine calibrator, use your index fingers to press the locking levers inward until they are snapped into place. Listen for the click.

2. Engine calibrator cover.
3. Electronic control module into vehicle.
4. Connectors.
5. Driver's kick panel.
6. Negative battery cable.

FUNCTIONAL CHECK

1. Turn ignition "ON."
2. Enter diagnostics (see diagnostic circuit check for procedure).
   A. Code 12 should flash at least four times. (No other codes present). This indicates the engine calibrator is installed properly.
   B. If Code 51 occurs or if the "Check Engine" light is "ON" constantly with no codes, the engine calibrator is not fully seated, has bent pins, or is defective.
      - If not fully seated, press firmly on engine calibrator assembly.(Figure 3.1-5).
      - If pins bend, remove engine calibrator, straighten pins, and reinstall.

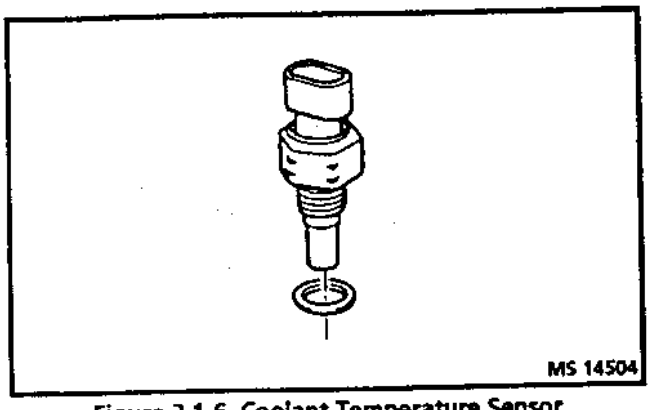


Figure 3.1-6 Coolant Temperature Sensor

COOLANT TEMPERATURE SENSOR
Figures 3.1-6 and 3.1-7

Important

- Care must be taken when handling coolant sensor. Damage to coolant sensor will affect proper operation of the Fuel Injection system.

Remove or Disconnect

1. Ignition "OFF."
2. Electrical connector.
3. Carefully back out coolant temperature sensor.

Install or Connect

1. Sensor in engine.
2. Electrical connector.

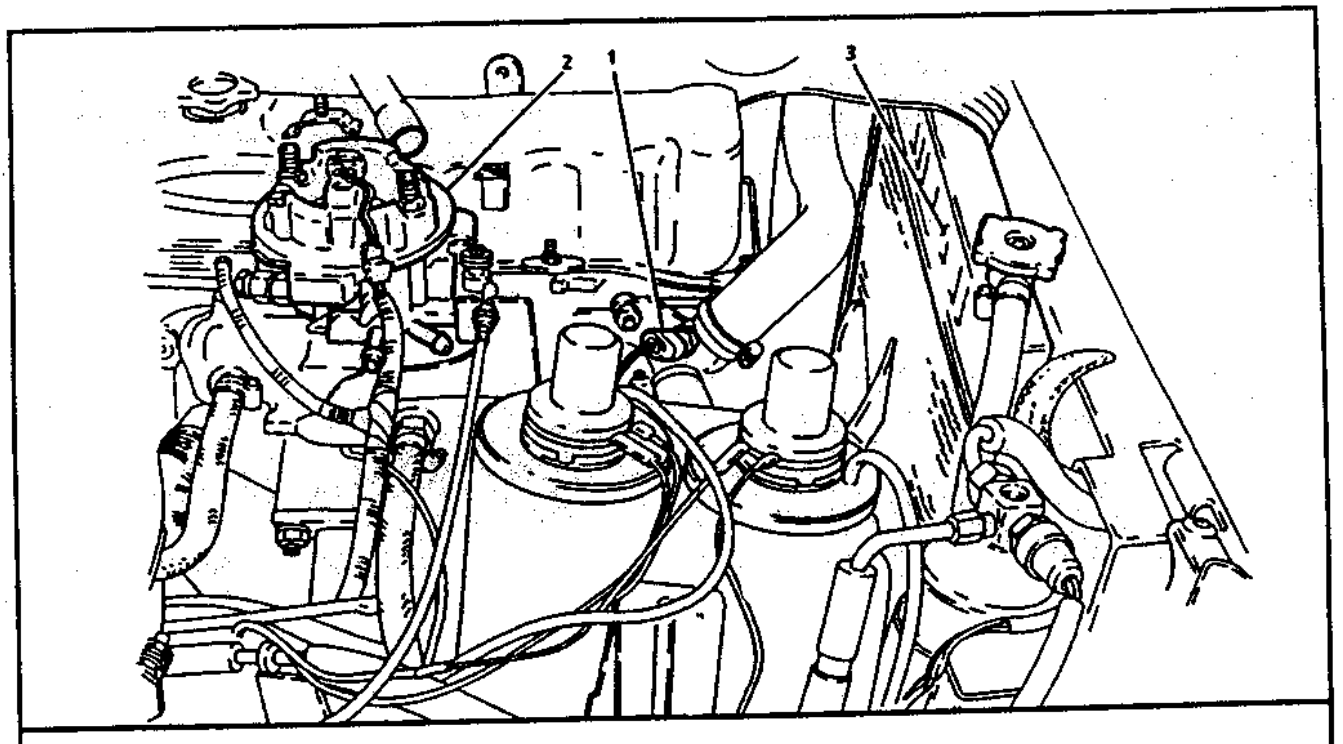


Figure 3.1-7 Coolant Temperature Sensor Location

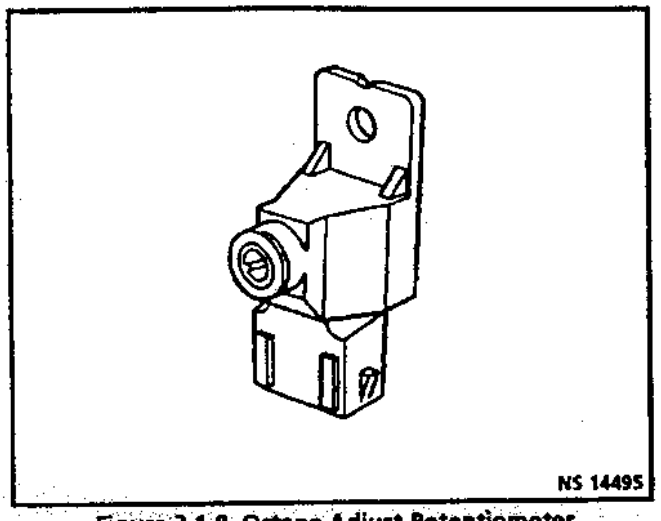


Figure 3.1-8 Octane Adjust Potentiometer

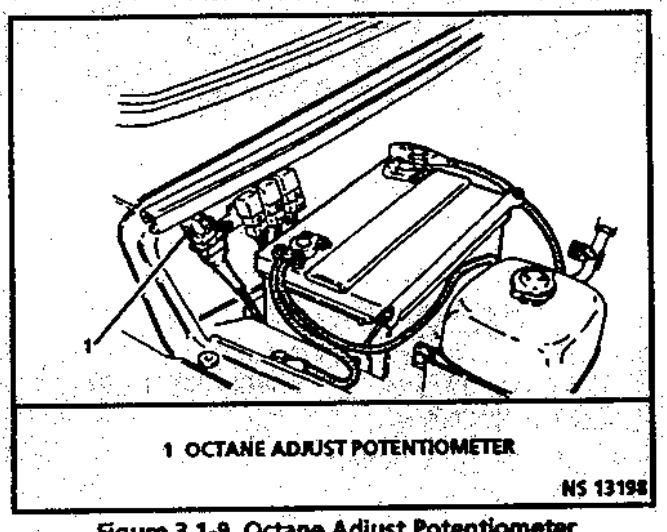


Figure 3.1-9 Octane Adjust Potentiometer Location View

OCTANE ADJUSTMENT POTENTIOMETER
Figures 3.1-8 and 3.1-9

Remove or Disconnect

1. Electrical connector.
2. Mounting screw(s).
3. Octane adjustment potentiometer.

Install or Connect

1. Octane adjustment potentiometer.
2. Mounting screw(s).
3. Electrical connector.
4. The octane adjust potentiometer is preset at the factory at 0° of retard. If an adjustment is needed, refer to CHART C-15.

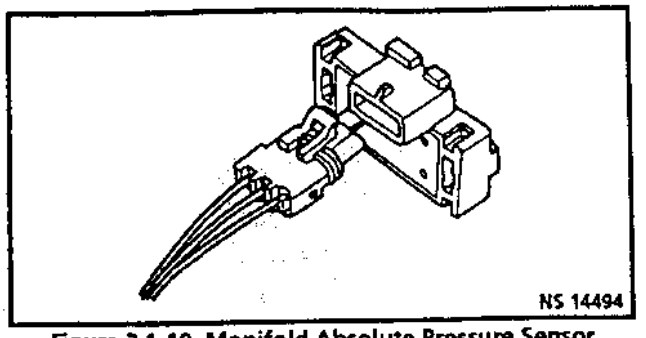


Figure 3.1-10 Manifold Absolute Pressure Sensor

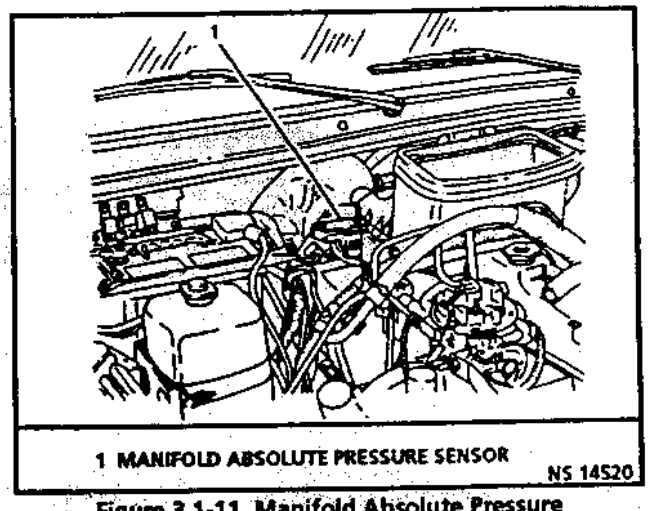


Figure 3.1-11 Manifold Absolute Pressure Sensor Location

MANIFOLD ABSOLUTE PRESSURE SENSOR
Figure 3.1-10 and 3.1-11

Other than checking for loose hoses and electrical connections, the only service possible is unit replacement if diagnosis shows sensor to be faulty.

Remove or Disconnect

1. Remove air cleaner.
2. Manifold absolute pressure hose.
3. Manifold absolute pressure electrical connector.
4. Mounting screws.
5. Manifold absolute pressure sensor.

Install or Connect

1. Manifold absolute pressure sensor.
2. Mounting screws.
3. Manifold absolute pressure electrical connector.
4. Manifold absolute pressure hose.
5. Air cleaner.

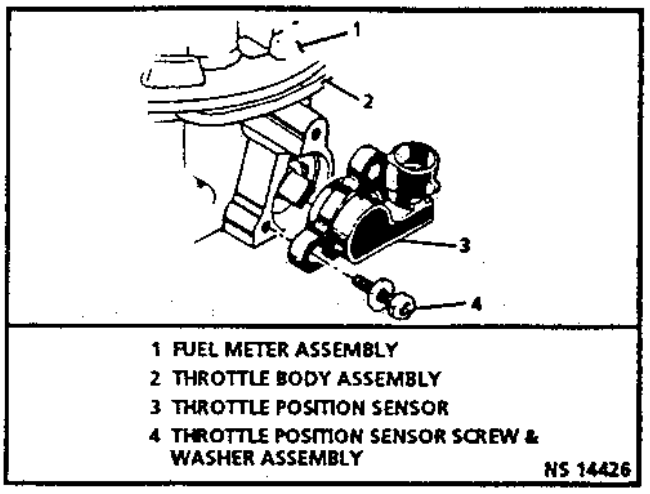


Figure 3.1-12 Throttle Position Sensor

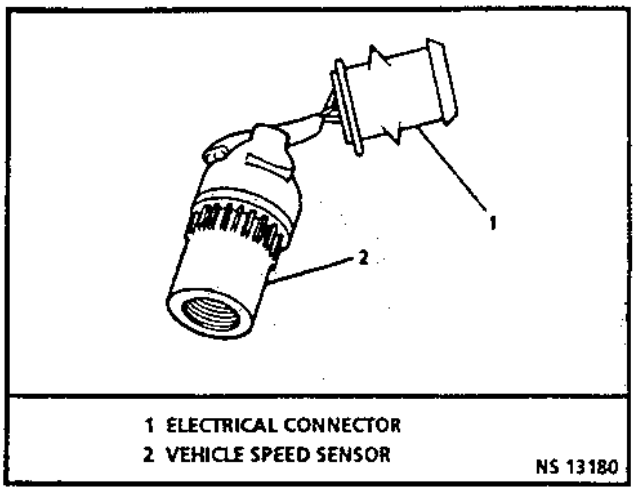


Figure 3.1-14 Vehicle Speed Sensor

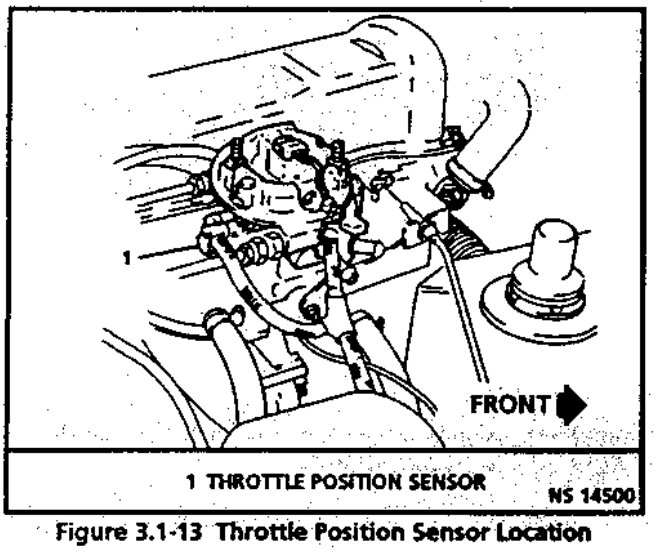


Figure 3.1-13 Throttle Position Sensor Location

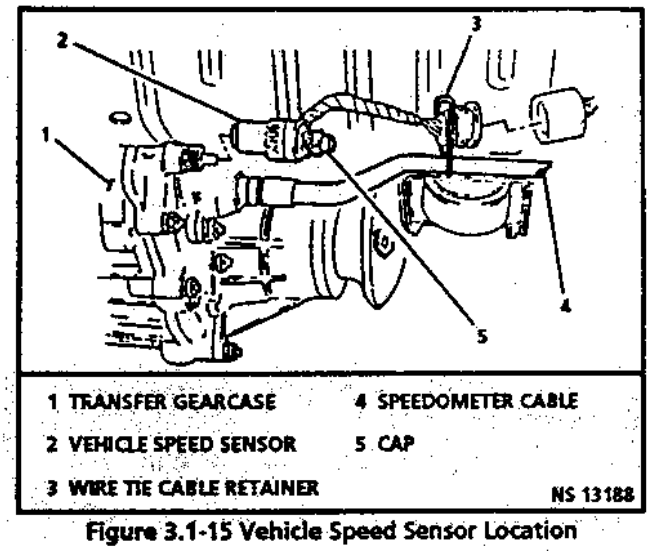


Figure 3.1-15 Vehicle Speed Sensor Location

THROTTLE POSITION SENSOR
Figure 3.1-12 and 3.1-13

Remove or Disconnect

1. Air cleaner.
2. Electrical connector.
3. Two throttle position sensor attaching screws and lock washers.
4. Sensor.

Install or Connect

1. Throttle position sensor on throttle body assembly with throttle valve in normal closed position, and throttle position sensor drive tangs aligned with flats on end of the shaft.
2. Throttle position sensor attaching screw and washer assembly on throttle position sensor assembly.
3. Electrical connector.
4. Air cleaner.

Tighten

- Attaching screws to 2.0 N·m (18 lb. in.).

VEHICLE SPEED SENSOR
Figure 3.1-14 and 3.1.-15

Remove or Disconnect

1. Three wire harness connectors.
2. Wire tie cable retainer that secures the vehicle speed sensor connector to the speedometer cable.
3. Vehicle speed sensor from transmission connection.

Install or Connect

1. Vehicle speed sensor to transmission connection.
2. Cable that secures the vehicle speed sensor to the speedometer.
3. Three wire harness connectors.

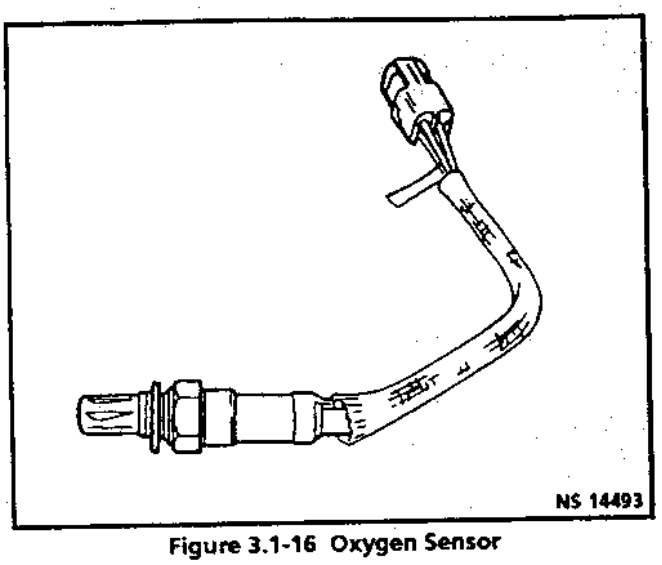


Figure 3.1-16 Oxygen Sensor

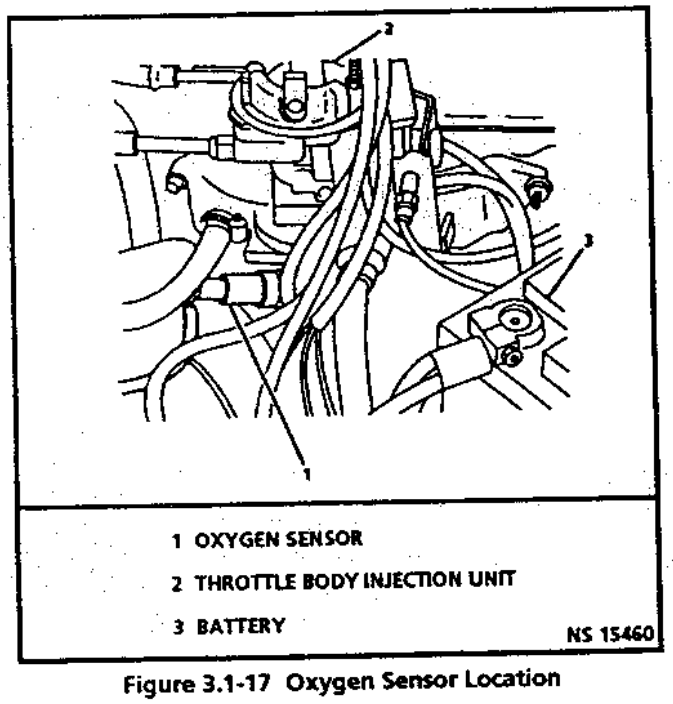


Figure 3.1-17 Oxygen Sensor Location

OXYGEN SENSOR
Figures 3.1-16 and 3.1-17

Remove or Disconnect

1. Negative battery cable.
2. Electrical connector.
3. Carefully back out oxygen sensor.

- The oxygen sensor may be difficult to remove when engine temperature is below 48°C. Excessive force may damage threads in exhaust manifold or exhaust pipe.

Important

- Take care when handling the new oxygen sensor. The in-line electrical connector and louvered end must be kept free of grease, dirt or other contaminants. Also, avoid using cleaning solvents of any type. Do not drop or roughly handle the oxygen sensor.

Install or Connect

Important

- A special anti-seize compound is used on the oxygen sensor threads. The compound consists of a liquid graphite and glass beads. The graphite will burn away, but the glass beads will remain, making the sensor easier to remove.
- New or service sensors will already have the compound applied to the threads.

1. Sensor and torque to 41 N·m (30 lb. ft.).
2. Electrical connector.
3. Negative battery cable.

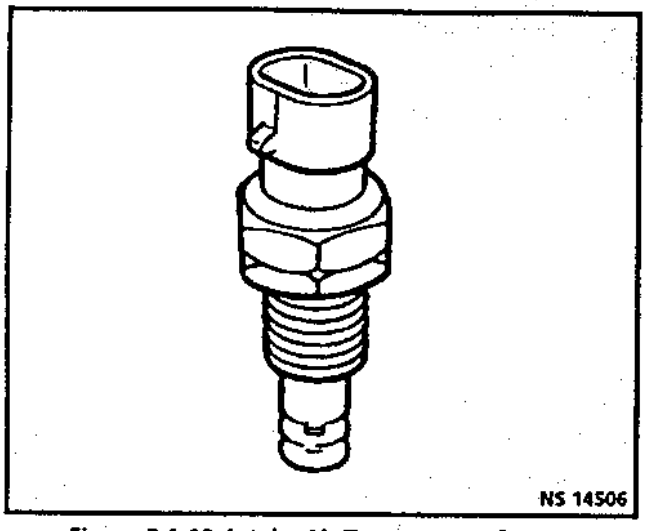
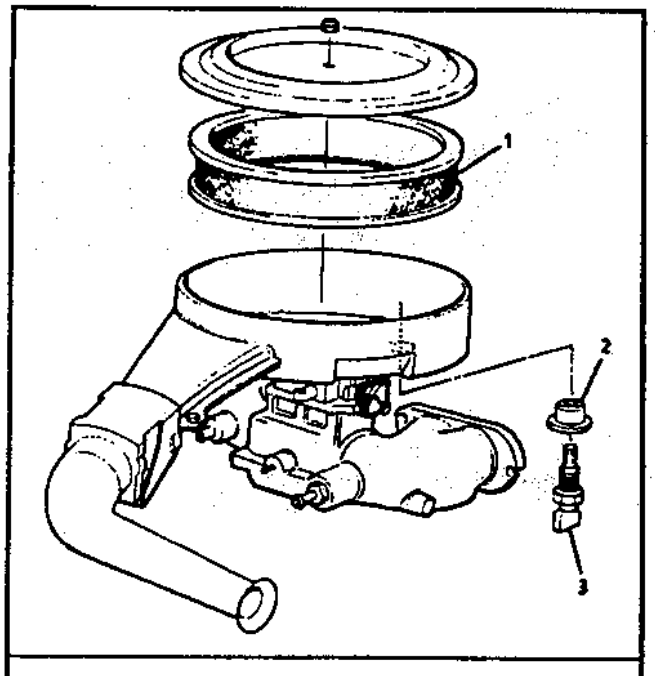


Figure 3.1-18 Intake Air Temperature Sensor



1 FILTER ELEMENT I.D. NO.
2 GROMMET
3 INTAKE AIR TEMPERATURE SENSOR

NS 14448

Figure 3.1-19 Intake Air Temperature Sensor Location View

INTAKE AIR TEMPERATURE SENSOR
Figures 3.1-18 and 3.1-19

The intake air temperature sensor is located in the air cleaner. The sensor is threaded into the air cleaner as shown in Figure 3.1-19. Be careful not to over tighten the sensor as you install it into the air cleaner.

Remove or Disconnect

1. Electrical connector.
2. Sensor.

Install or Connect

1. Sensor.
2. Electrical connector.

3.2 FUEL CONTROL SYSTEM

FUEL CONTROL

Always start with the "Diagnostic Circuit Check" in Section "2". This will reduce diagnosis time and prevent unnecessary replacement of parts. The information in this check will direct diagnosis concerning "Engine Cranks But Won't Run" and the Fuel Control System, including diagnosis of the injector, pressure regulator, fuel pump and fuel system relay.

Idle Air Control Valve

A Tech 1 "Scan" tool reads idle air control valve position in "Counts" (or steps). "0" steps indicates the electronic control module is commanding the idle air control valve to be driven in, to a fully seated position (minimum idle air). The higher the number of steps, the more idle air is being allowed to pass by the idle air control valve.

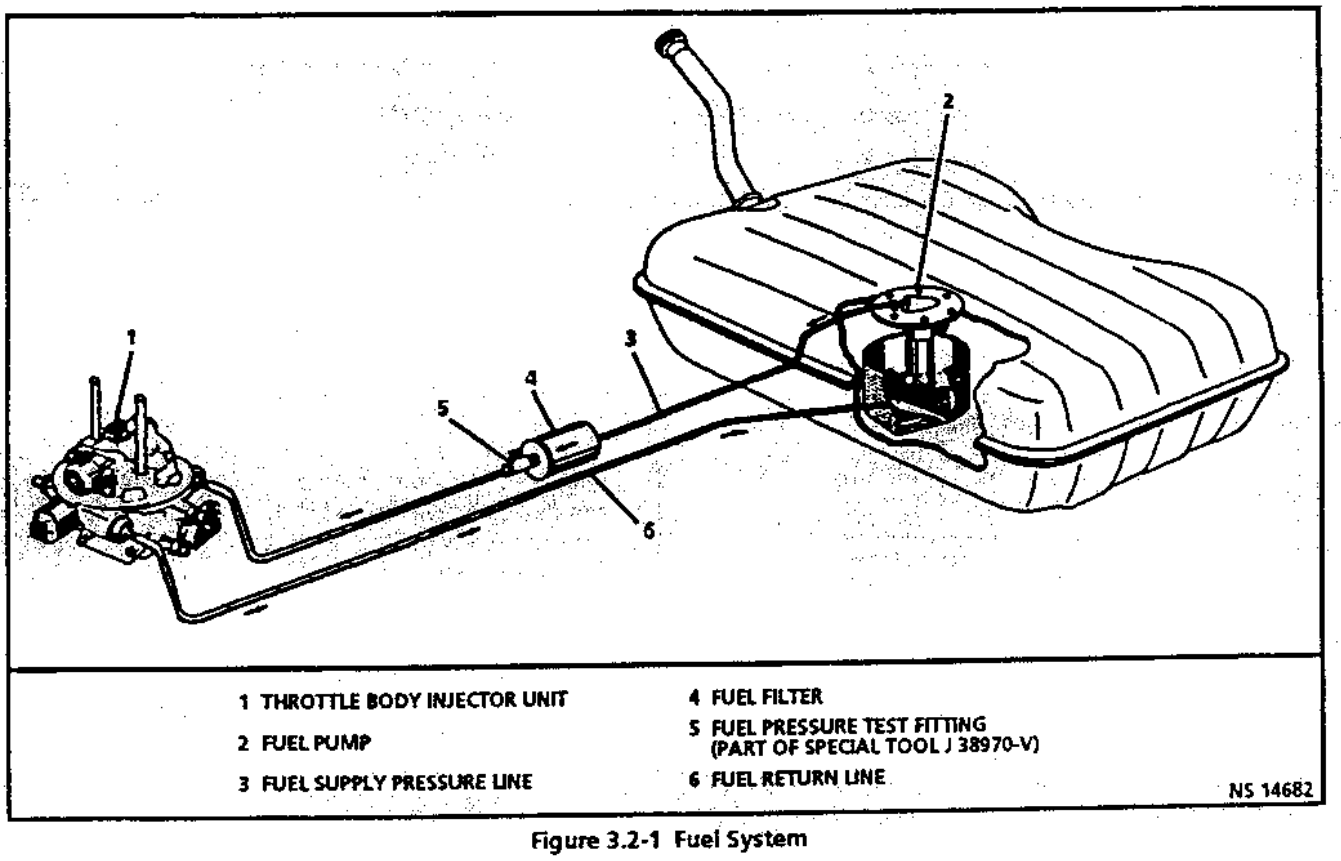
Refer to CHART C-2C to diagnose the operation of the idle air control valve.

ON-VEHICLE SERVICE

GENERAL SERVICE INFORMATION

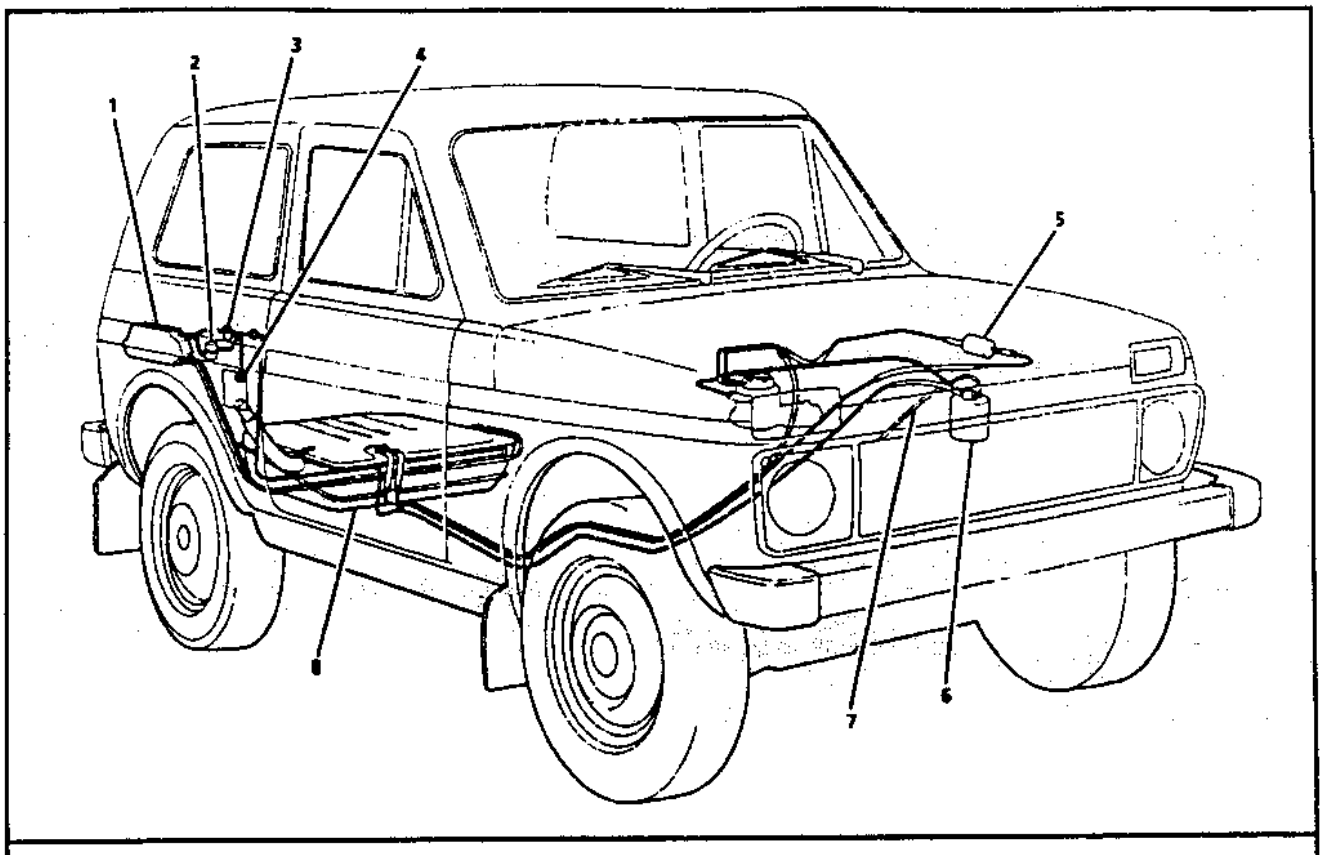
CAUTION:

- **To prevent personal injury or damage to the vehicle as the result of an accidental start, disconnect and reconnect the negative battery cable before and after service is performed.**
- **To minimize the risk of fire or personal injury, relieve the fuel system pressure before servicing the throttle body injection unit or any of its fuel handling components. (See "Fuel Pressure Relief Procedure," page 3-28.)**
- **Also, catch any fuel that leaks out when disconnecting the fuel lines by covering the fittings with a shop cloth. Place the cloth in an approved container when work is complete.**



1 THROTTLE BODY INJECTOR UNIT
2 FUEL PUMP
3 FUEL SUPPLY PRESSURE LINE
4 FUEL FILTER
5 FUEL PRESSURE TEST FITTING (PART OF SPECIAL TOOL J 38970-V)
6 FUEL RETURN LINE

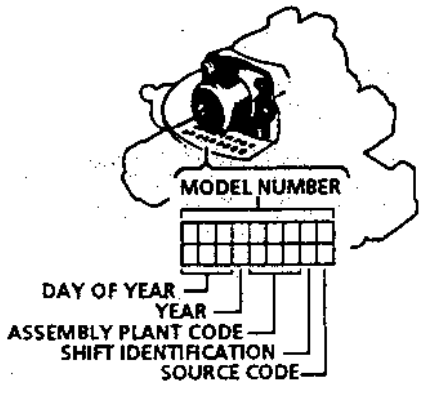
Figure 3.2-1 Fuel System



1 VAPOR LIQUID SEPARATOR
2 ROLL OVER VALVE
3 TANK PRESSURE CONTROL VALVE
4 BLOWOFF VALVE
5 FILTER
6 EVAPORATIVE LOSS CANISTER
7 AIR VENT PIPE
8 PUMP IN TANK

NS 14444

Figure 3.2-2 Additional Fuel System Components in Relation to Location on NIVA



THROTTLE BODY INJECTION – IDENTIFICATION

IS 0047-6E

Figure 3.2-3 Throttle Body Injection Identification

The throttle body injection unit repair procedures cover component replacement with the unit on the vehicle. However, throttle body replacement requires that the complete unit be removed from the engine.

Refer to the disassembled view (Figure 3.2-2A, see Page 3-31) for identification of parts during repair procedures. Service repair of individual components is performed without removing the throttle body injection unit from the engine.

SERVICE IDENTIFICATION

The Model 700 throttle body injection unit is supplied with the following standard markings:

- Model Number.
- Day, Year, Plant, Shift and Source code.

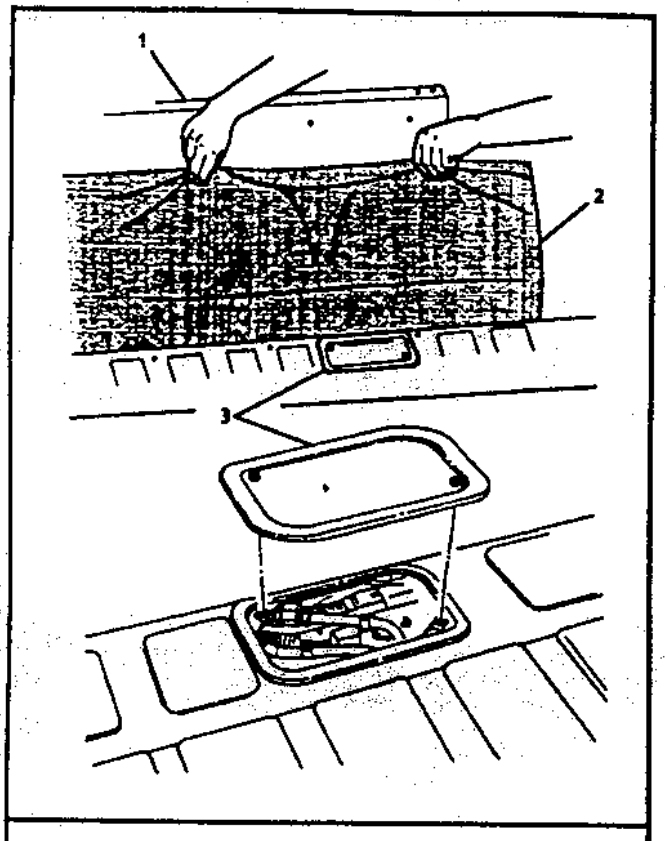


Figure 3.2-4 Fuel Pump Access Panel Location View

The fuel meter assembly is rollmarked with an eight (8) digit model number, date (Julian), year, assembly plant code, shift identification and source code. Figure 3.2-3 shows the rollmark format. Refer to this model number when replacement is required. If the throttle body injection is removed, it is essential that care is taken to prevent damage to the throttle valve or sealing surface while performing any service.

Whenever service is performed on the throttle body injection, first remove the air cleaner and air cleaner gasket. Discard the gasket and replace it with a new one before replacing the air cleaner after service is complete.

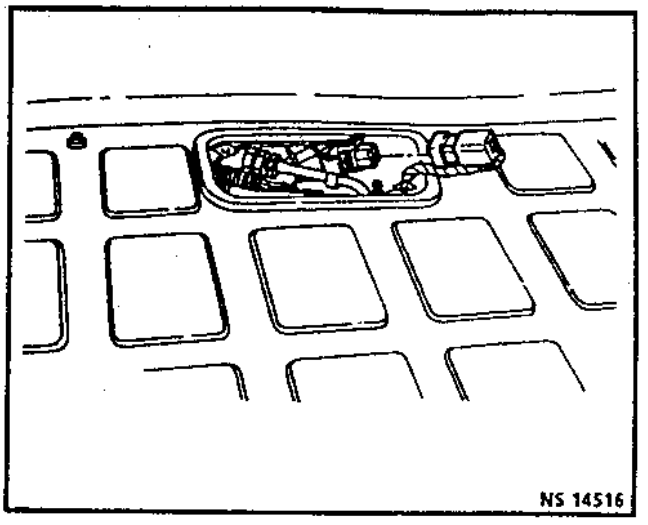


Figure 3.2-5 Fuel Pump Connector

FUEL PRESSURE RELIEF PROCEDURE

The throttle body injection Model 700 contains a "checking" fuel feature. This means that fuel pressure is maintained after the engine is shut "OFF." In order to bleed the system, the following procedure *must* be followed.

1. Place transmission selector in neutral, set parking brake, and block drive wheels.
2. Disconnect fuel pump connector at fuel pump (Figures 3.2-4 and 3.2-5).
3. Start engine and allow to idle until it stops running for lack of fuel.
4. Engage starter for three seconds to dissipate fuel pressure in lines. Fuel connections are now safe for servicing.
5. When pressure is relieved and servicing is complete, reconnect fuel pump connector.

FUEL SYSTEM PRESSURE TEST

A fuel system pressure test is part of several of the diagnostic charts and symptom checks. To perform this test, follow this procedure:

1. Turn engine "OFF" and relieve fuel pressure, following previous instructions under "Fuel Pressure Relief Procedure."
2. Install fuel pressure gauge onto fuel pressure test fitting making certain the connection is secure to avoid leaking fuel (Figures 3.2-6 and 3.2-7).

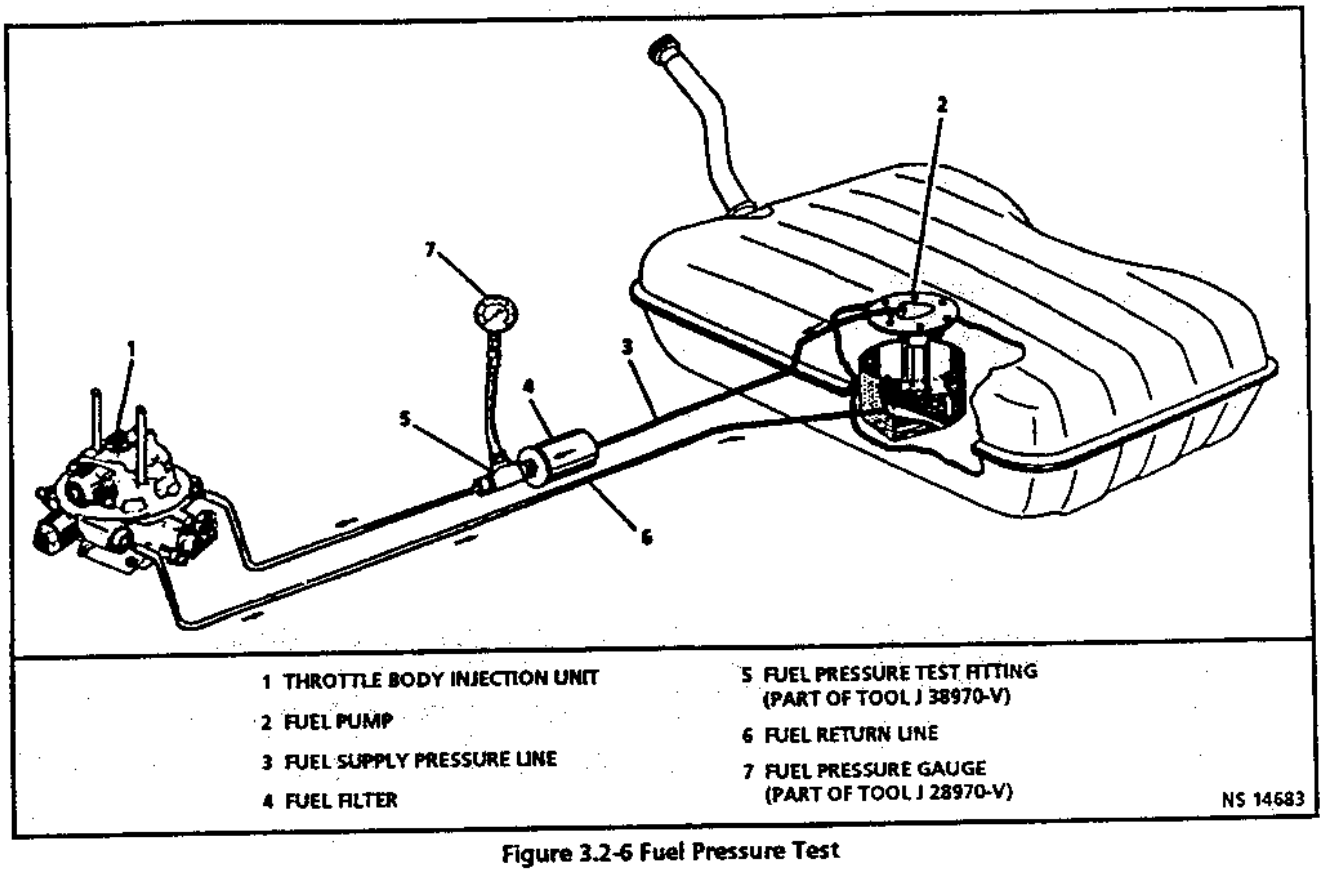

1 THROTTLE BODY INJECTION UNIT
2 FUEL PUMP
3 FUEL SUPPLY PRESSURE LINE
4 FUEL FILTER
5 FUEL PRESSURE TEST FITTING (PART OF TOOL J 38970-V)
6 FUEL RETURN LINE
7 FUEL PRESSURE GAUGE (PART OF TOOL J 28970-V)
NS 14683

Figure 3.2-6 Fuel Pressure Test

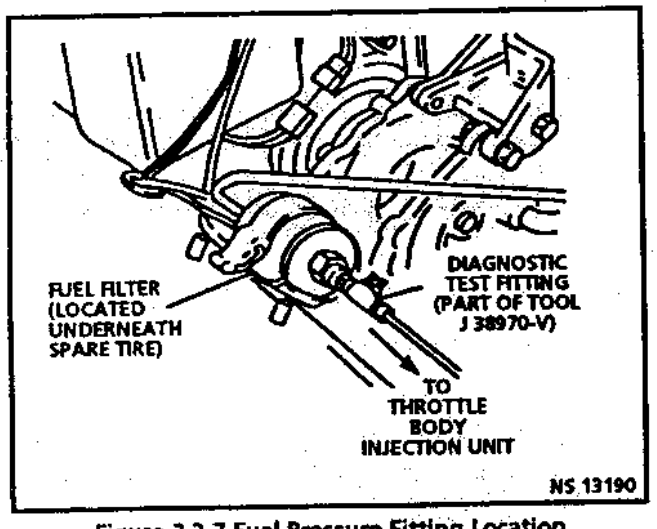

FUEL FILTER (LOCATED UNDERNEATH SPARE TIRE)
DIAGNOSTIC TEST FITTING (PART OF TOOL J 38970-V)
TO THROTTLE BODY INJECTION UNIT
NS 13190

Figure 3.2-7 Fuel Pressure Fitting Location

3. Energize fuel system relay by turning ignition key to the "ON" position. Observe fuel pressure reading, it should be 191.6 to 206.8 kPa (27.8 to 30 psi, 1.9 to 2.1 bar). If not, refer to Chart A-5 or A-7.
4. Relieve fuel pressure. (See "Fuel Pressure Relief.")
5. Remove fuel pressure gauge from fuel pressure test fitting.
6. Start vehicle and check for fuel leaks.
7. Install air cleaner.

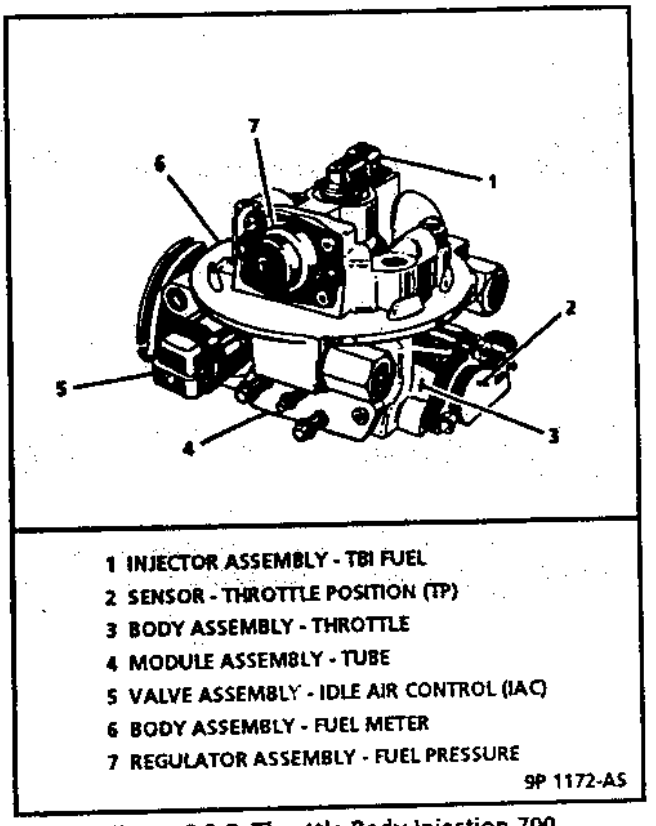

1 INJECTOR ASSEMBLY - TBI FUEL
2 SENSOR - THROTTLE POSITION (TP)
3 BODY ASSEMBLY - THROTTLE
4 MODULE ASSEMBLY - TUBE
5 VALVE ASSEMBLY - IDLE AIR CONTROL (IAC)
6 BODY ASSEMBLY - FUEL METER
7 REGULATOR ASSEMBLY - FUEL PRESSURE
9P 1172-AS

Figure 3.2-8 Throttle Body Injection 700 Components

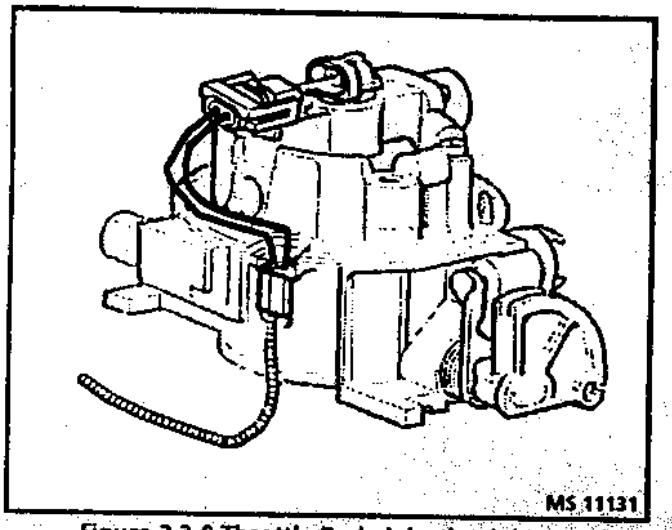


Figure 3.2-9 Throttle Body Injection Injector Electrical Connector

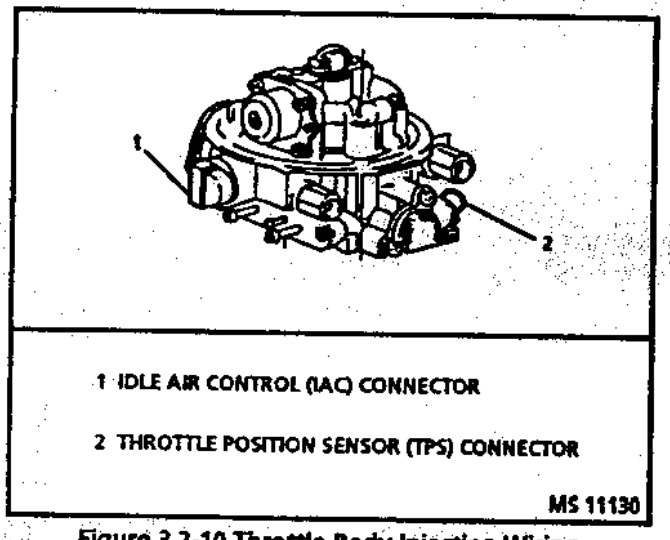


Figure 3.2-10 Throttle Body Injection Wiring

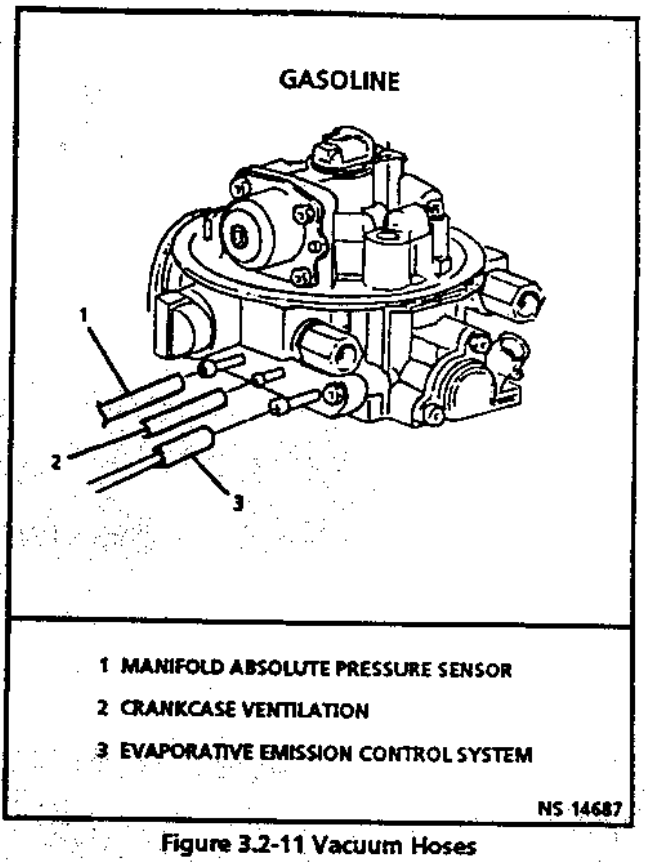


Figure 3.2-11 Vacuum Hoses

THROTTLE BODY INJECTION UNIT

If the throttle body injection unit is removed, it is essential that care is taken to prevent damage to the throttle valve or sealing surface while performing any service.

When a service throttle body injection unit is installed, first remove the air cleaner and air cleaner gasket. Discard the gasket and replace it with a new one before replacing the air cleaner after service is complete.

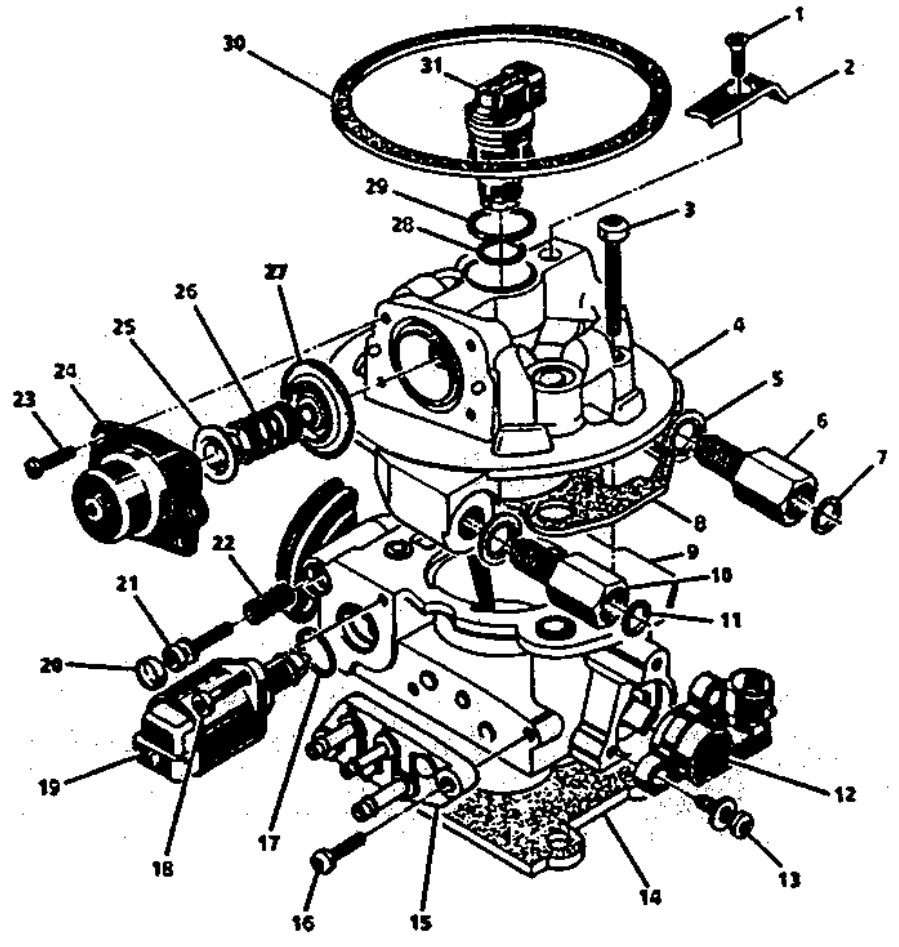
Remove or Disconnect

1. Electrical connectors for idle air control valve, throttle position sensor, and fuel injector (Figure 3.2-10);
2. Grommet with injector wires from throttle body injection assembly (Figure 3.2-9);
3. Throttle linkage.
4. Vacuum hoses, noting positions of hoses (Figure 3.2-11);
5. Inlet and outlet fuel hose nuts, using back-up wrench (Figure 3.2-12).

CAUTION: Refer to fuel pressure relief procedure before servicing fuel systems. See page 3-28.

6. Fuel line O-rings from nuts and discard.
7. Throttle body injection mounting hardware.
8. Throttle body injection unit from intake manifold (Figure 3.2-13).
9. Throttle body injection flange (manifold mounting) gasket and discard.

NOTICE: Stuff the manifold opening with a rag to prevent material from entering the engine, and remove the old gasket materials from surface of intake manifold.



1 SCREW - INJECTOR RETAINER ATTACHING
2 RETAINER - INJECTOR
3 SCREW - FUEL METER BODY - THROTTLE BODY
4 FUEL METER BODY ASSEMBLY
5 SEAL - FUEL FITTING
6 FITTING - FUEL INLET
7 O-RING, FUEL LINE INLET NUT
8 GASKET - FUEL METER BODY TO THROTTLE BODY
9 THROTTLE BODY ASSEMBLY
10 FITTING - FUEL OUTLET
11 O-RING, FUEL LINE OUTLET NUT
12 SENSOR, THROTTLE POSITION (TPS)
13 SCREW ASSEMBLY - TPS ATTACHING
14 GASKET - FLANGE
15 TUBE MODULE ASSEMBLY
16 SCREW - TUBE MODULE ASSEMBLY
17 O-RING, IAC VALVE
18 SCREW - IAC VALVE ATTACHING
19 IDLE AIR CONTROL (IAC) VALVE ASSEMBLY
20 PLUG - IDLE STOP SCREW
21 IDLE STOP SCREW ASSEMBLY
22 SPRING - IDLE STOP SCREW
23 SCREW - PRESSURE REGULATOR ATTACHING
24 PRESSURE REGULATOR COVER ASSEMBLY
25 SEAT - PRESSURE REGULATOR SPRING
26 SPRING - PRESSURE REGULATOR
27 PRESSURE REGULATOR DIAPHRAGM ASSEMBLY
28 O-RING - FUEL INJECTOR - LOWER
29 O-RING - FUEL INJECTOR - UPPER
30 GASKET - AIR CLEANER
31 TBI INJECTOR ASSEMBLY

PS 17728

Figure 3.2-2A Model 700 Throttle Body Injection Parts Identification

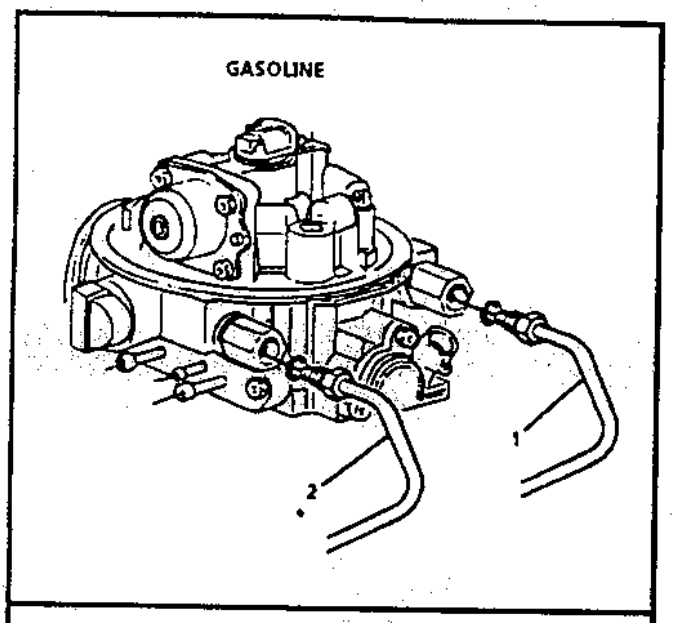


Figure 3.2-12 Fuel Hoses

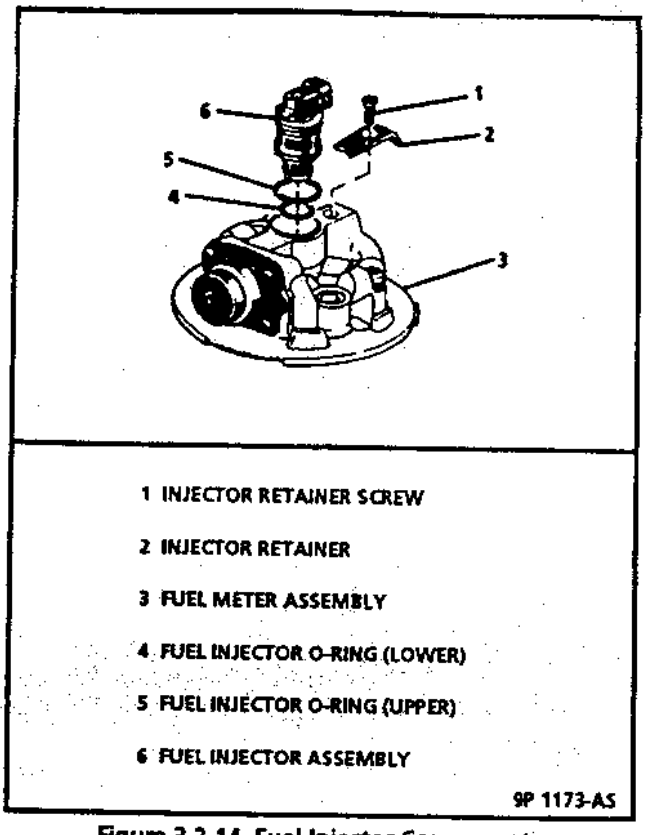


Figure 3.2-14 Fuel Injector Components

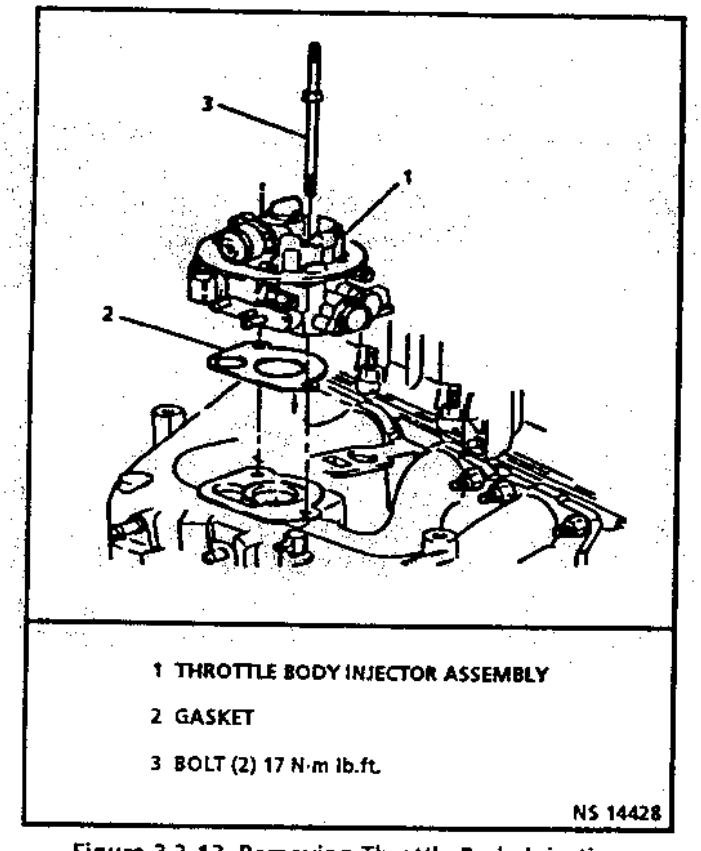


Figure 3.2-13 Removing Throttle Body Injection 700 Unit

Clean and Inspect

NOTICE: The throttle position sensor, idle air control valve, pressure regulator diaphragm assembly, fuel injector, or other components containing rubber, SHOULD NOT be placed in a solvent or cleaner bath. A chemical reaction will cause these parts to swell, harden or distort. Do not soak the throttle body with the above parts attached. If the throttle body requires cleaning, soaking time in the cleaner should be kept to a minimum. Some models have hidden throttle shaft dust seals that could lose their effectiveness by extended soaking.

1. Clean all metal parts thoroughly, and blow dry with shop air. Be sure that all fuel and air passages are free of dirt or burrs.
2. Inspect mating casting surfaces for damage that could affect gasket sealing.

- Manifold bore for loose parts, foreign material, etc.
- Intake manifold sealing surfaces for cleanliness.

Install or Connect

1. New throttle body injection flange (manifold mounting) gasket
2. Throttle body injection with mounting hardware.

Tighten

- Mounting hardware to 17 N·m (12 lb. ft.).

3. New O-rings on fuel line nuts.
4. Fuel line inlet and outlet nuts by hand.

Tighten

- Inlet and outlet nuts to 27 N·m (20 lb. ft.) (Use backup wrench to keep throttle body injection nuts from turning.)

5. Vacuum hoses.
6. Throttle linkage.
7. Grommet with wires to fuel meter assembly.
8. Electrical connectors, making sure connectors are fully seated and latched.
9. Check to see if accelerator pedal is free by depressing pedal to the floor and releasing while engine is "OFF." Check for correct Wide Open Throttle adjustment.
10. Energize the fuel system relay by turning the ignition key to the "ON" position and check for leaks.
11. Start engine and check for fuel leaks.

FUEL INJECTOR ASSEMBLY

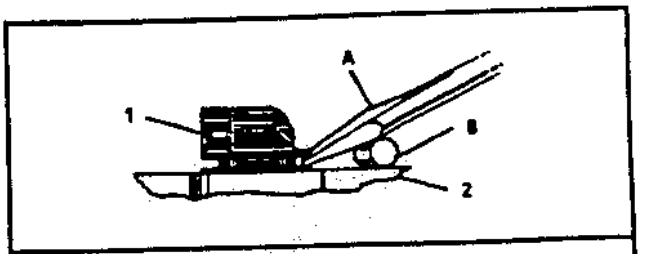
Figures 3.2-14, 3.2-15, 3.2-16 and 3.2-17

CAUTION: Refer to fuel pressure relief procedure before servicing fuel systems. See page 3-28.

Replacement

The fuel injector is serviced only as a complete assembly.

NOTICE: Use care in removing injector, to prevent damage to the electrical connector on top of the injector, and nozzle. Also, because the fuel injector is an electrical component, it should not be immersed in any type of liquid solvent or cleaner, as damage may occur.



A SCREWDRIVER BLADE
B FULCRUM
1 FUEL INJECTOR ASSEMBLY
2 FUEL METER BODY
BP 0912-AS

Figure 3.2-15 Removing Throttle Body Injection 700 Fuel Injector

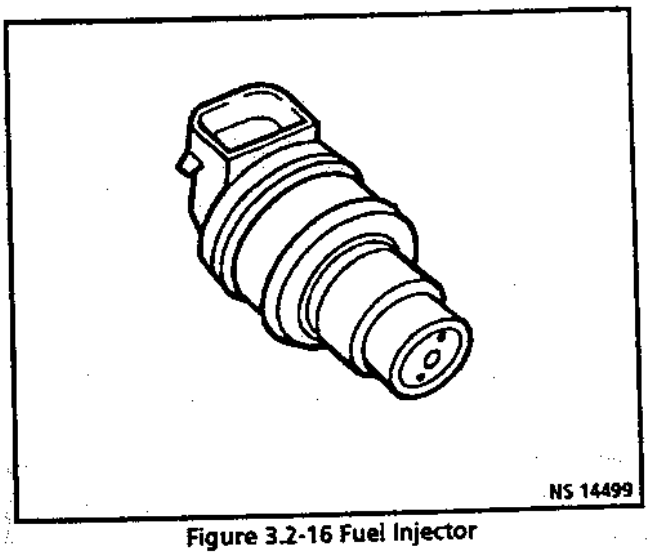
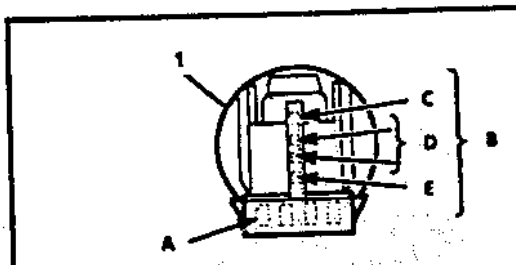


Figure 3.2-16 Fuel Injector



1 FUEL INJECTOR (TOP VIEW)
A PART NUMBER
B BUIL DATE CODE
C MONTH
1-9 (JAN-SEP)
O, N, D (OCT, NOV, DEC)
D DAY
E YEAR
BP 0913-AS

Figure 3.2-17 Fuel Injector Part Number Location

Remove or Disconnect

1. Electrical connector to fuel injector.
2. Injector retainer screw and retainer.
3. Using a fulcrum, place screwdriver blade under ridge opposite connector end and carefully pry injector out (Figure 3.2-15).
4. Remove upper and lower O-rings from injector and in fuel injector cavity and discard.

Inspect

- Fuel injector filters for evidence of dirt and contamination. The upper (large diameter) filter is the purge filter, the lower (smaller diameter) filter is the inlet filter. If present, check for presence of dirt in fuel lines and fuel tank.

Important

- Be sure to replace the injector with an identical part. Injectors from other models can fit in the Model 700 throttle body injection, but are calibrated for different flow rates. (See Figure 3.2-17 for part number location.)

Install or Connect

1. Lubricate new upper and lower O-rings with automatic transmission fluid and place them on injector. (Make sure upper O-ring is in groove and lower one is flush up against inlet filter-smaller.)
2. Injector assembly, pushing it straight into fuel injector cavity.

Important

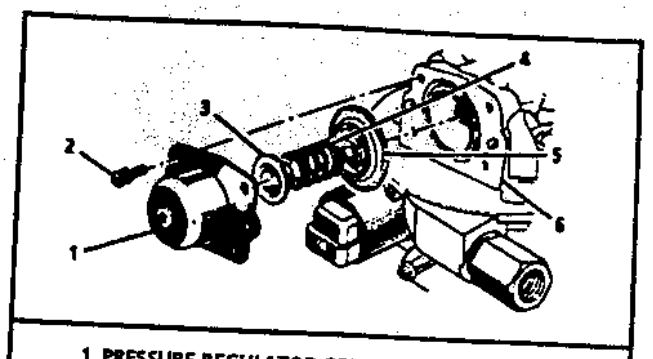
- Be sure the electrical connector end on the injector is facing in the general direction of the cut-out in the fuel meter body for the wire grommet.

3. Injector retainer, using appropriate thread locking compound on retainer attaching screw.
4. Electrical connector to fuel injector.

Tighten

- Injector retainer attaching screw to 3.0 N·m (28.0 lb. in.).

5. Energize the fuel system relay by turning the ignition key to the "ON" position and check for leaks.



1 PRESSURE REGULATOR COVER ASSEMBLY
2 COVER SCREW AND WASHER ASSEMBLY
3 SPRING SEAT
4 SPRING
5 DIAPHRAGM ASSEMBLY
6 FUEL METER ASSEMBLY

8P 0914-A5

Figure 3.2-18 Throttle Body Injection 700 Pressure Regulator

PRESSURE REGULATOR ASSEMBLY

CAUTION: Refer to fuel pressure relief procedure before servicing fuel systems. See page 3-28.

Replacement
Figure 3.2-18

NOTICE: To prevent leaks, the pressure regulator diaphragm assembly *must be replaced* whenever the cover is removed.

Remove or Disconnect

1. Four pressure regulator attaching screws, while keeping pressure regulator compressed.

CAUTION: The pressure regulator contains a large spring under heavy compression. Use care when removing the screws to prevent personal injury.

2. Pressure regulator cover assembly.
3. Pressure regulator spring.
4. Spring seat.
5. Pressure regulator diaphragm assembly.

Inspect

- Pressure regulator seat in fuel meter body cavity for pitting, nicks, or irregularities. (Use magnifying glass if necessary). If any of above is present, the whole fuel body casting *must be replaced.*

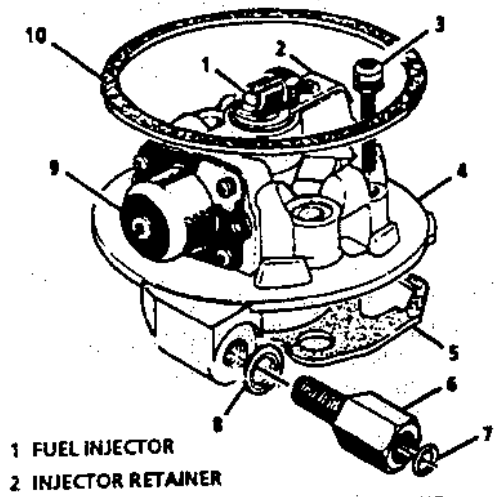


Figure 3.2-19 Fuel Meter Assembly

Install or Connect

1. New pressure regulator diaphragm assembly, making sure it is seated in groove in fuel meter body.
2. Regulator spring seat and spring into cover assembly.
3. Cover assembly over diaphragm, while aligning mounting holes.

   NOTICE: Use care while installing the pressure regulator to prevent misalignment of diaphragm and possible leaks.

4. Four screw assemblies that have been coated with appropriate thread locking compound, while maintaining pressure on regulator spring.

   ### Tighten

   - Attaching screw assemblies to 2.5 N·m (22.0 lb. in.).

5. Energize the fuel system relay by turning the ignition key to the "ON" position and check for leaks.

FUEL METER ASSEMBLY

CAUTION: Refer to fuel pressure relief procedure before servicing fuel systems. See page 3-28.

Replacement
Figure 3.2-19

Remove or Disconnect

1. Electrical connector from fuel injector.
2. Grommet with wires from fuel meter assembly.
3. Inlet and outlet fuel line nuts, using back-up wrench.
4. Fuel line O-rings from nuts and discard.
5. Throttle body injection mounting hardware.
6. Two fuel meter body attaching screw and washer assemblies.
7. Fuel meter assembly from throttle body assembly.
8. Fuel meter body to throttle body gasket and discard.

Install or Connect

1. New fuel meter body to throttle body gasket. Match cut-out portions of gasket with openings in throttle body assembly.
2. Fuel meter assembly.
3. Two fuel meter body attaching screw and washer assemblies that have been coated with appropriate locking compound.

   ### Tighten

   - Attaching screws to 6.0 N·m (53 lb. in.).

4. Throttle body injection unit mounting hardware.

   ### Tighten

   - Mounting hardware to 17 N·m (12 lb. ft.).

5. New O-rings on fuel line nuts.
6. Fuel line inlet and outlet nuts by hand.

   ### Tighten

   - Inlet and outlet nuts to 27 N·m (20 lb. ft.). (Use back-up wrench to keep throttle body injection nuts from turning.)

7. Grommet with wires to fuel meter assembly.
8. Electrical connector to fuel injector, making sure it is fully seated and latched.
9. Energize the fuel system relay by turning the ignition key to the "ON" position and check for leaks.

THROTTLE POSITION SENSOR
Replacement
Figure 3.2-20

Remove or Disconnect

1. Electrical connector from throttle position sensor.
2. Screw assemblies and throttle position sensor.

NOTICE: The throttle position sensor is an electrical component and should not be immersed in any type of liquid solvent or cleaner, as damage may result.

Install or Connect

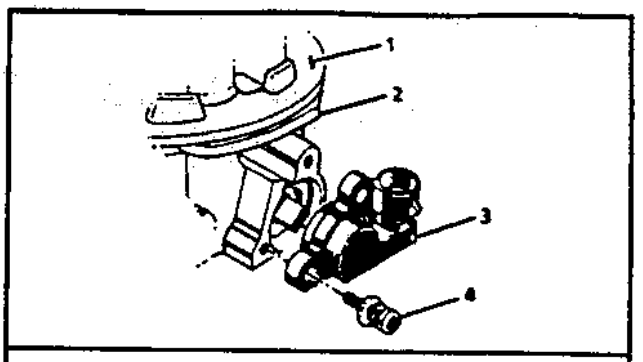
1. With throttle valve in normally closed position, install throttle position sensor on throttle shaft and rotate counterclockwise to align mounting holes.
2. Attaching screw and washer assemblies.

Tighten

- Screw assemblies to 2.0 N·m (18.0 lb. in.).

3. Electrical connector to throttle position sensor.
4. Check for throttle position sensor output as follows:

- Connect Tech 1 to read throttle position sensor output voltage.
- With ignition "ON" and engine stopped, throttle position sensor voltage should be less than 1.25 volts. If more than 1.25 volts, replace throttle position sensor.



1 FUEL METER ASSEMBLY
2 THROTTLE BODY ASSEMBLY
3 THROTTLE POSITION SENSOR
4 TPS ATTACHING SCREW AND WASHER ASSEMBLY

8P 0916-AS

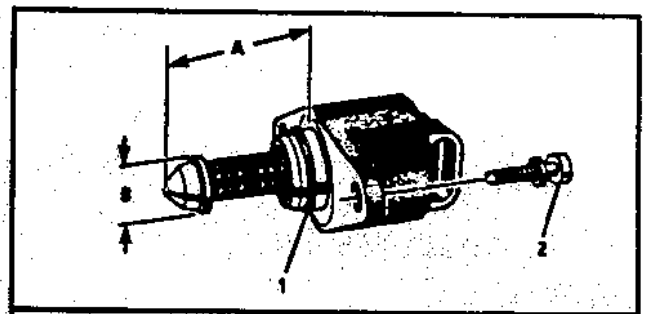
Figure 3.2-20 Throttle Position Sensor

IDLE AIR CONTROL VALVE
Replacement
Figure 3.2-21

NOTICE: The idle air control valve is an electrical component and must not be soaked in any liquid cleaner or solvent. Otherwise, damage could result.

Important

- On throttle body injection Model 700, the idle air control valve is flange-mounted, with a dual taper, 10 mm diameter pintle. If replacement is necessary, only an idle air control valve identified with the correct part number (having the appropriate pintle shape and diameter) should be used.



1 IDLE AIR CONTROL VALVE O-RING
2 IDLE AIR CONTROL VALVE ATTACHING SCREW ASSEMBLY
A DISTANCE OF PINTLE EXTENSION
B DIAMETER OF PINTLE

NS 14429

Figure 3.2-21 Flange-Mount Idle Air Control Valve

Remove or Disconnect

1. Electrical connector from idle air control valve.
2. Screw assemblies and idle air control valve.
3. Idle air control valve O-ring and discard. New O-ring is included in service replacement kit.

NOTICE: Before inserting the idle air control valve assembly, measure the distance from the idle air control valve mounting flange to the point of the idle air control valve pintle. If the pintle is extended too far, damage to the idle air control valve assembly may result. (Figure 3.2-21).

Measure

- Distance from idle air control valve mounting flange to the point of pintle. Distance *must be* less than 28 mm.

Adjust, if necessary

- If distance is greater than 28 mm, apply firm hand pressure to retract it. (A slight side-to-side motion may be helpful.)

Install or Connect

1. New O-ring on idle air control valve.
2. Idle air control assembly in throttle body assembly with attaching screws.
3. Electrical connector to idle air control valve.

Important

- No adjustment of the idle air control valve is made after installation. With the Tech 1 connected and engine running, select "Miscellaneous Tests," then "Idle System," then "Idle Reset." This will command the electronic control module to reset the idle air control valve.

TUBE MODULE ASSEMBLY

Replacement
Figure 3.2-22

Remove or Disconnect

1. Tube module assembly attaching screws.
2. Tube module assembly.
3. Tube module assembly gasket (O-ring) and discard.

Clean

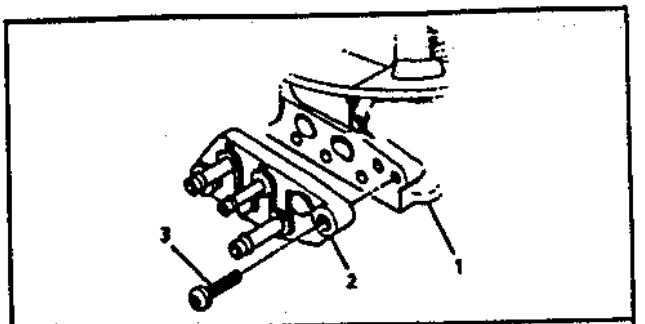
- Old gasket (O-ring) material from surface of throttle body assembly to ensure proper seal of new gasket (O-ring).

Install or Connect

1. New tube module assembly gasket (O-ring).
2. Tube module assembly.
3. Tube module assembly attaching screws.

Tighten

- Screw assemblies to 3.0 N·m (28.0 lb.in.).



1 THROTTLE BODY ASSEMBLY

2 TUBE MODULE ASSEMBLY

3 TUBE MODULE SCREW ASSEMBLY

PS 17729

Figure 3.2-22 Tube Module Assembly

THROTTLE BODY ASSEMBLY

CAUTION: Refer to fuel pressure relief procedure before servicing fuel systems. See page 3-28.

Replacement
Figure 3.2-23

NOTICE: Procedures related to replacement of the individual components below have been described previously and should be followed or damage could occur.

Remove or Disconnect

1. Throttle body injection unit, as described above.
2. Fuel meter body-to-throttle body attaching screw and washer assemblies.
3. Fuel meter assembly.
4. Fuel meter body to throttle body gasket and discard.

Disassemble

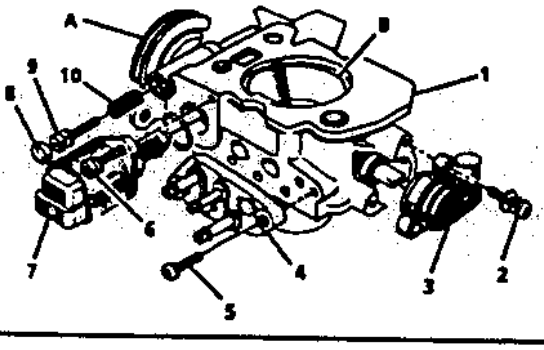
- Throttle position sensor, idle air control valve and tube module assembly from old throttle body assembly, according to previous instructions.

Assemble

- Throttle position sensor, idle air control valve, and tube module assembly onto replacement throttle body assembly, according to previous instructions.

Install or Connect

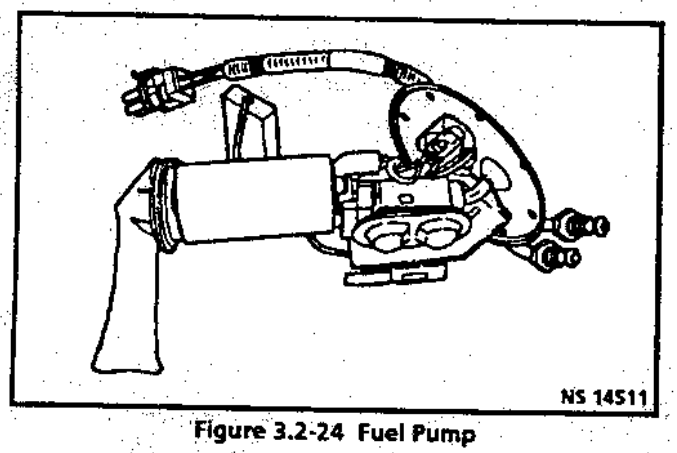
1. New fuel meter body to throttle body gasket.
2. Fuel meter assembly on throttle body assembly.
3. Fuel meter body-to-throttle body attaching screw and washer assemblies.



A THROTTLE LEVER
B THROTTLE BORE
1 THROTTLE BODY ASSEMBLY
2 THROTTLE POSITION SENSOR ATTACHING SCREW & WASHER ASSEMBLY
3 THROTTLE POSITION SENSOR
4 TUBE MODULE ASSEMBLY
5 TUBE MODULE ATTACHING SCREW ASSEMBLY
6 IDLE AIR CONTROL VALVE ATTACHING SCREW
7 IDLE AIR CONTROL VALVE
8 IDLE STOP SCREW PLUG
9 IDLE STOP SCREW AND WASHER ASSEMBLY
10 IDLE STOP SCREW SPRING

PS 17730

Figure 3.2-23 Throttle Body Assembly - Typical



NS 14511

Figure 3.2-24 Fuel Pump

Tighten

- Screws to 6.0 N·m (53 lb. in.).

4. Throttle body injection unit onto engine, as described in "Throttle Body Injection Unit."

FUEL PUMP

CAUTION: Refer to fuel pressure relief procedure before servicing fuel systems. See page 3-28.

Replacement

The fuel pump (see Figure 3.2-24) is a roller vane type, electric pump, mounted inside of the fuel tank.

Fuel is pumped at a positive pressure above 190.2 kPa (27.6 psi, 1.9 bar) from the fuel pump through the in-line filter to the pressure regulator in the throttle body injection assembly. Excess fuel is returned to the fuel tank through the fuel return line.

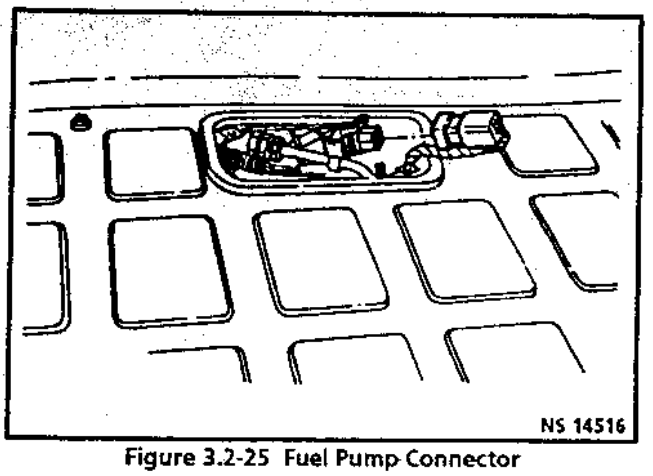
Vapor lock problems are reduced when using an electric pump because the fuel is pushed under pressure rather than pulled under vacuum, a condition that produces vapor.

Remove or Disconnect

1. Fold rear seat forward and lift up mat covering storage area.
2. Fuel pump access cover.
3. Fuel pump electrical connector (Figure 3.2-4 and 3.2-25).
4. Fuel lines.
5. Fuel tank from vehicle after removing hold down straps and bolts.
6. Fuel pump retaining bolts and carefully remove pump from tank.

Install or Connect

1. New fuel pump into fuel tank.
2. Fuel pump retaining bolts. Tighten securely.
3. Fuel tank under vehicle and secure using hold down straps and bolts.
4. Fuel lines.



NS 14516

Figure 3.2-25 Fuel Pump Connector

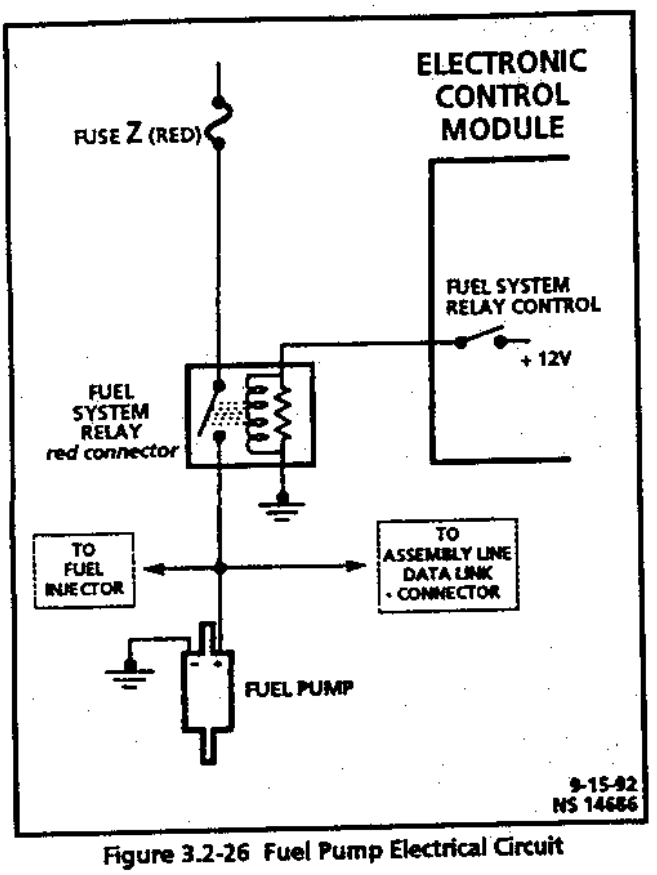


Figure 3.2-26 Fuel Pump Electrical Circuit

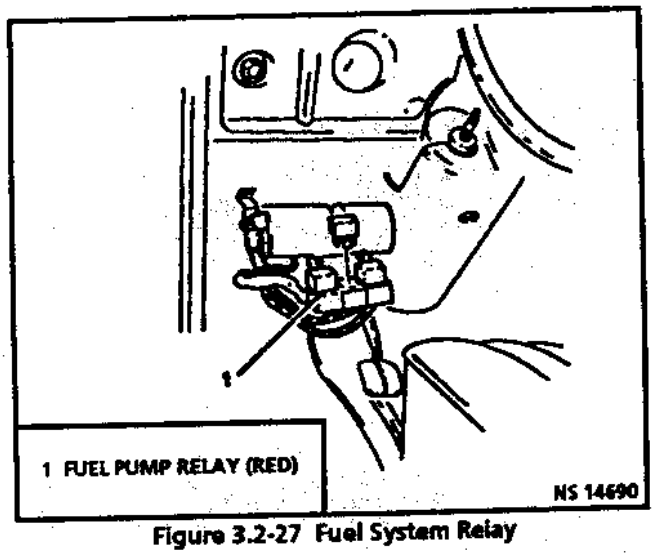


Figure 3.2-27 Fuel System Relay

5. Fuel pump electrical connector.
6. Fuel pump access cover.
7. Return rear seat to normal position.

Energize the fuel system relay by turning the ignition key to the "ON" position and check for leaks.

FUEL PUMP ELECTRICAL CIRCUIT
Figure 3.2-26

When the ignition is first turned "ON" without the engine running, the electronic control module will turn the fuel pump relay "ON" for two seconds. This builds up the fuel pressure quickly. If the engine is not cranked within two seconds, the electronic control module will shut the fuel pump "OFF" and wait for the reference signal. As soon as the engine is cranked, the electronic control module will turn the relay "ON" and run the fuel pump.

FUEL SYSTEM RELAY
Figure 3.2-27

The fuel system relay is mounted in the fuse panel. Other than checking for loose connectors, the only service possible is replacement (see Figure 3.2-27).

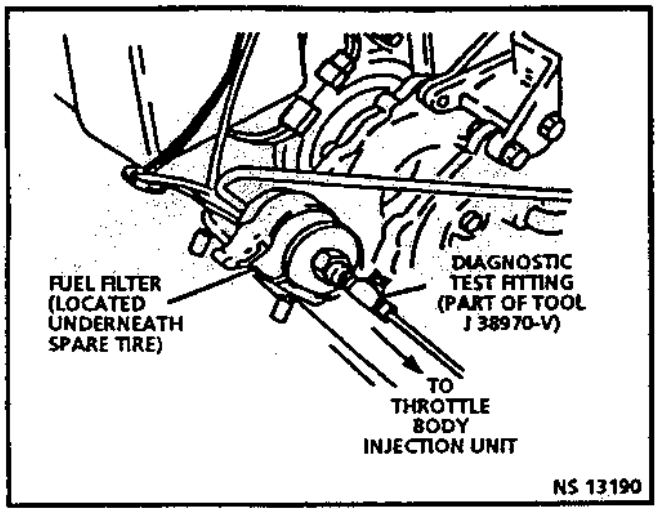

FUEL FILTER (LOCATED UNDERNEATH SPARE TIRE)
DIAGNOSTIC TEST FITTING (PART OF TOOL J 38970-V)
TO THROTTLE BODY INJECTION UNIT
NS 13190

Figure 3.2-28 Fuel Filter

FUEL FILTER

CAUTION: Refer to fuel pressure relief procedure before servicing fuel systems. See page 3-28.

Replacement
Figure 3.2-28

Important

- Before proceeding, refer to the "Fuel Pressure Relief" procedure found earlier in this section.

Remove or Disconnect

1. Fuel line to fuel filter attachment nuts. (Be careful not to lose the O-rings that are installed between the fuel filter and fuel lines.)
2. Fuel filter hold down strap.

Important

- Inspect O-rings for cuts, nicks or abrasions. Replace if necessary.

Install or Connect

1. Fuel filter hold-down strap.
2. Fuel line to fuel filter attachment nuts, including the rubber O-rings.

Energize the fuel system relay by turning the ignition key to the "ON" position and check for leaks.

3.3 EVAPORATIVE EMISSION CONTROL SYSTEM

ON-VEHICLE SERVICE

VISUAL CHECK OF CANISTER

- Cracked or damaged, replace canister.
- Fuel leaking from bottom of canister vent hose, replace canister and check hoses and hose routing.

FUEL VAPOR CANISTER

Remove or Disconnect

1. Electrical connector.
2. Hoses from fuel vapor canister.
3. Attaching screws (2).
4. Fuel vapor canister.
5. Retaining clips.

Install or Connect

1. Retaining clips.
2. Fuel vapor canister as removed.
3. Attaching screws (2).

Tighten

- Fuel vapor canister attaching screws 3 N·m (27 lb. in.).

4. Hoses.
5. Electrical connector.

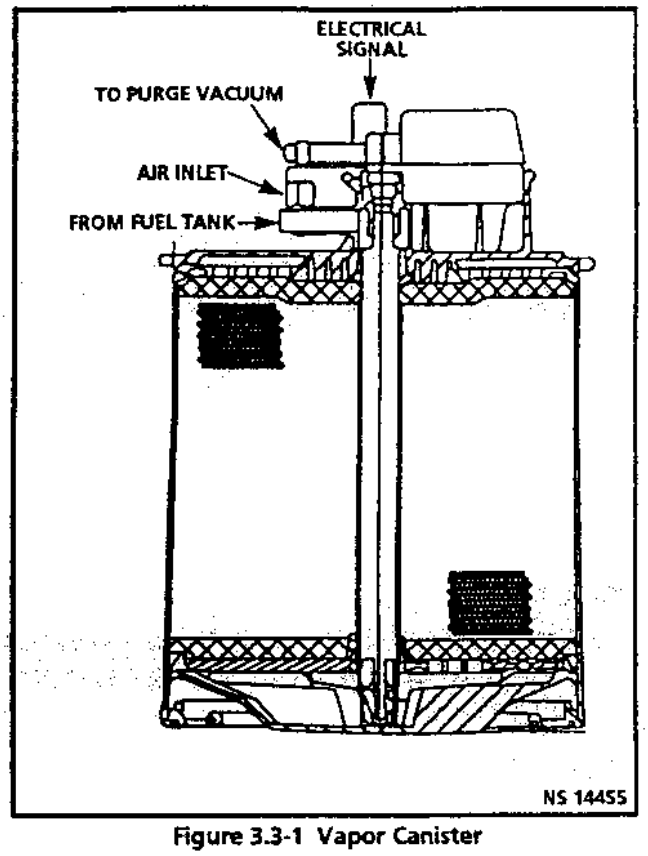
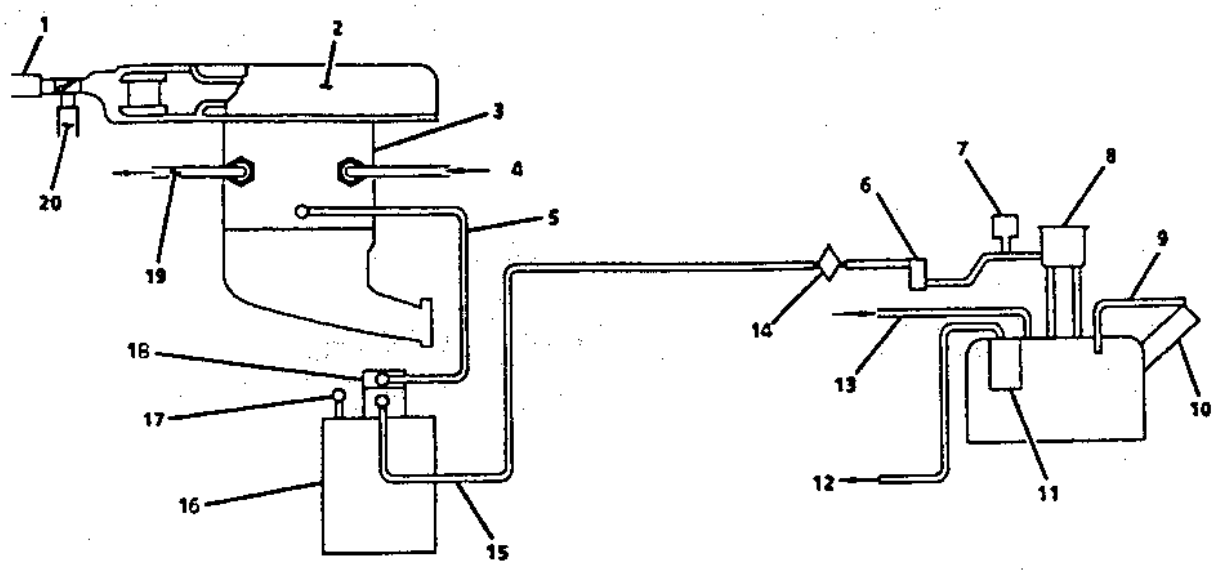


Figure 3.3-1 Vapor Canister

FUEL VAPOR CANISTER HOSES

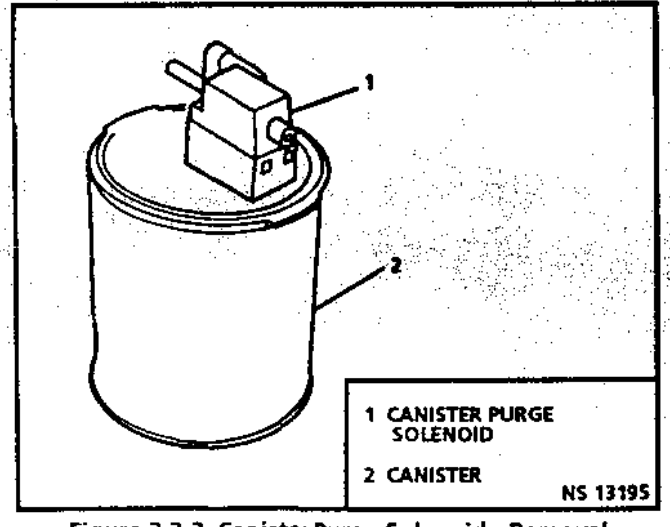
Refer to "Vehicle Emission Control Information" label for routing of fuel vapor canister hoses.



1 COLD AIR INTAKE
2 AIR FILTER
3 THROTTLE BODY INJECTION UNIT
4 FUEL SUPPLY
5 CANISTER PURGE
6 ROLL OVER FUEL SHUT OFF VALVE
7 TANK PRESSURE RELIEF VALVE
8 SEPARATOR
9 AIR OUTLET PIPE
10 FILL PIPE
11 ELECTRIC FUEL PUMP
12 FUEL INLET TO THROTTLE BODY INJECTION UNIT
13 FUEL RETURN FROM THROTTLE BODY INJECTION UNIT
14 TANK PRESSURE CONTROL VALVE
15 FUEL TANK VENT TO CANISTER
16 CANISTER
17 FRESH AIR IN
18 CANISTER ELECTRONIC VALVE
19 FUEL RETURN
20 HOT AIR INTAKE

NS 14449

Figure 3.3-2 Evaporative Emission Control System



1 CANISTER PURGE SOLENOID
2 CANISTER

NS 13195

Figure 3.3-3 Canister Purge Solenoid - Removal

3.4 DIRECT IGNITION SYSTEM

ON-VEHICLE SERVICE

DIRECT IGNITION SYSTEM ASSEMBLY
Figures 3.4-1 and 3.4-2

Remove or Disconnect

1. Negative battery cable.
2. Direct ignition system electrical connectors, including harness ground terminals from bracket.
3. Spark plug wires. (Note proper relationship of wires to coils.)
4. Direct ignition system assembly to engine bolts (3).
5. Direct ignition system assembly from engine.

Install or Connect

1. Direct ignition system assembly to engine.
2. Direct ignition system assembly to block bolts(3).

Tighten

- Torque to 20-30 N·m (15-22 lb. ft.).

3. Spark plug wires to proper coils.
4. Direct ignition system electrical connectors harness ground terminals.
5. Negative battery cable.

IGNITION COIL

Remove or Disconnect

1. Coil retaining screws (2 per coil).
2. Coil from module.

Install or Connect

1. Coil to module.
2. Coil retaining screws.

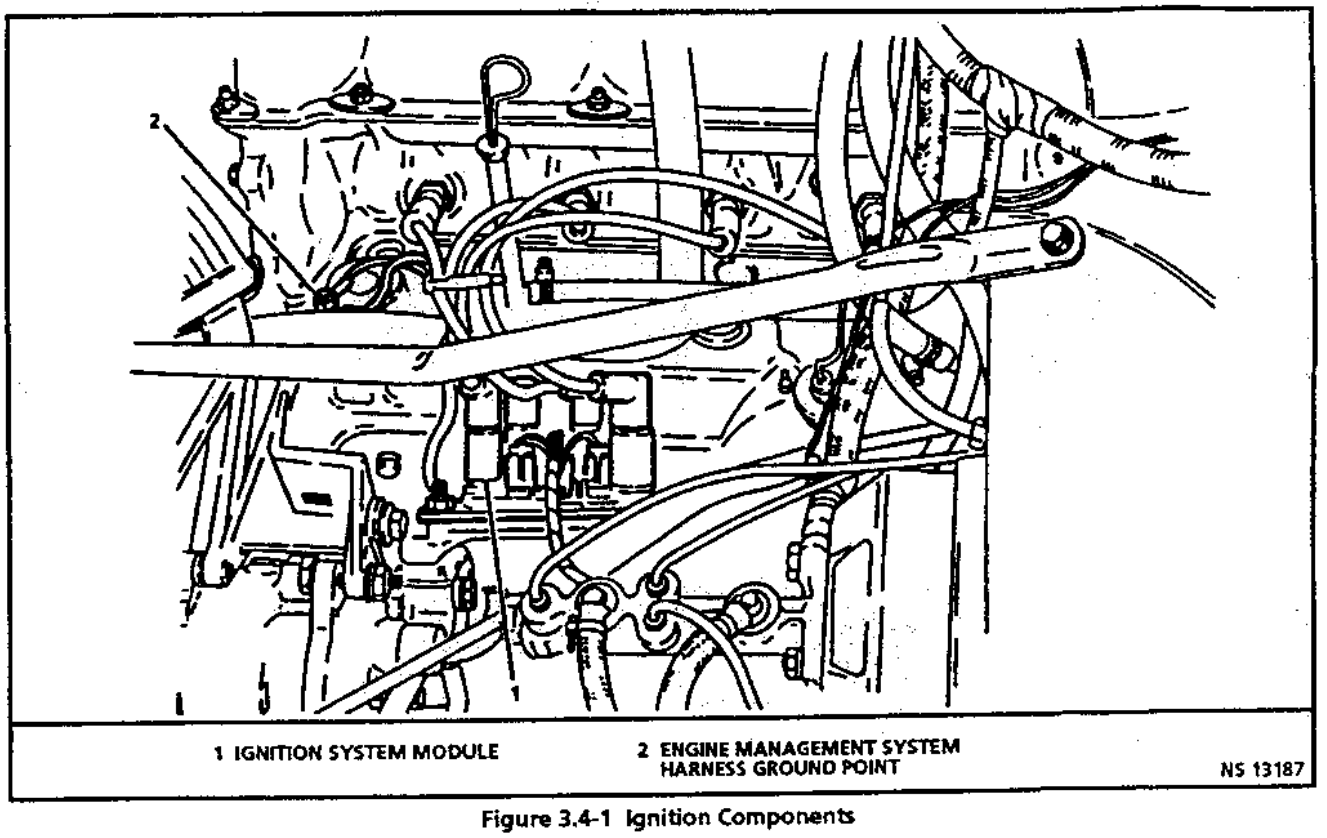
Tighten

- Torque to 4.5 N·m (40 lb. in.).

IGNITION MODULE

Remove or Disconnect

1. Negative battery cable.
2. Direct ignition system assembly from engine. (See previous procedure.)
3. Coils from assembly. (See previous procedure.)
4. Module from assembly plate.



1 IGNITION SYSTEM MODULE
2 ENGINE MANAGEMENT SYSTEM HARNESS GROUND POINT
NS 13187

Figure 3.4-1 Ignition Components

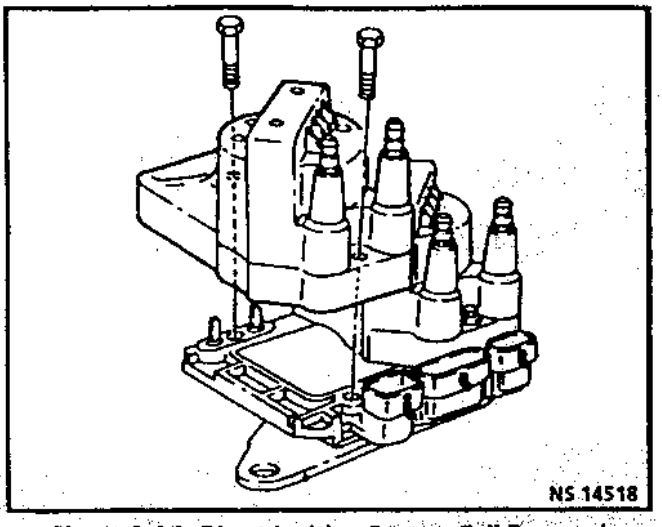


Figure 3.4-2 Direct Ignition System Coil Removal

Install or Connect

1. Module to assembly plate.
2. Coils. (See previous procedure.)
3. Direct ignition system assembly to engine. (See previous procedure.)
4. Negative battery cable.

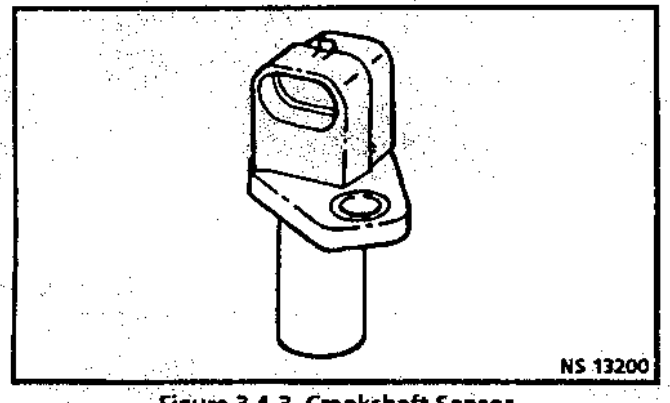


Figure 3.4-3 Crankshaft Sensor

CRANKSHAFT SENSOR
Figures 3.4-3 and 3.4-4

Remove or Disconnect

1. Sensor harness connector at module.
2. Sensor to block bolt (1).
3. Sensor from engine.

Inspect

- Sensor O-ring for wear, cracks or leakage. Replace if necessary. Lube new O-ring with engine oil before installing.

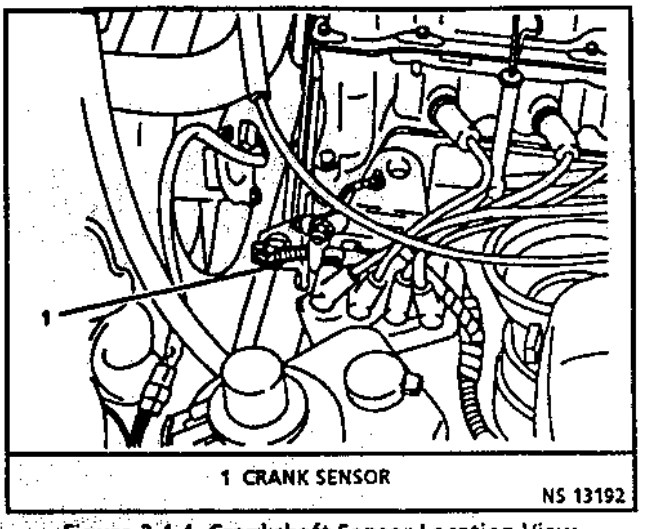


Figure 3.4-4 Crankshaft Sensor Location View

Install or Connect

1. Sensor into hold in block.
2. Sensor to block bolt (1).

Tighten

- Torque to 6-12 N·m (53-107 lb. in.).

3. Sensor harness connector at module.

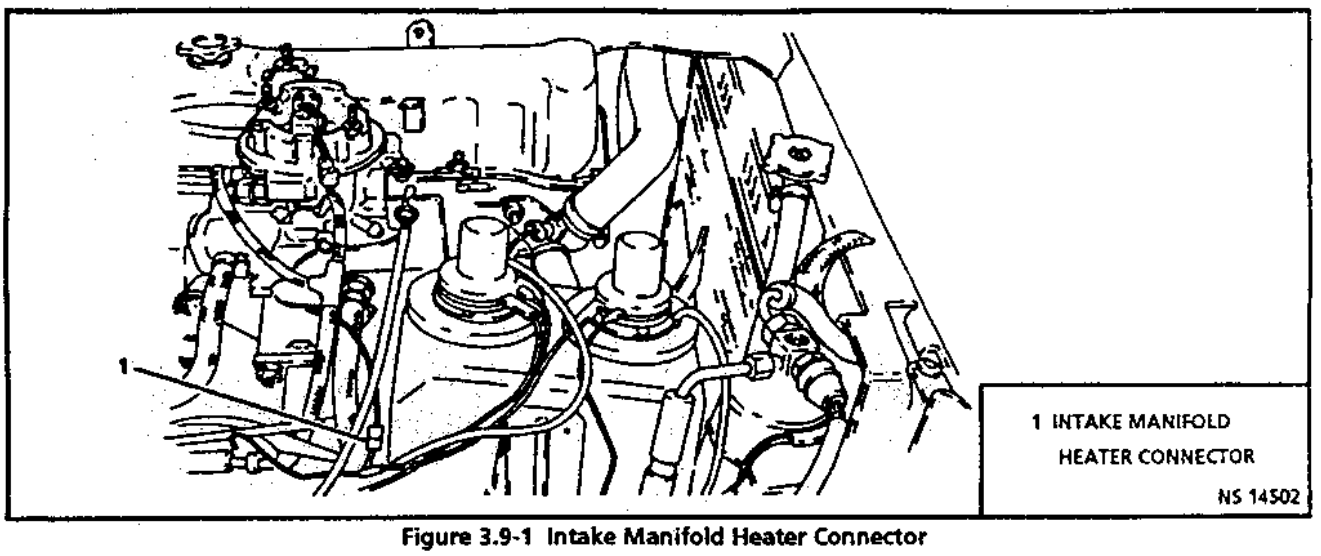


Figure 3.9-1 Intake Manifold Heater Connector

3.9 INTAKE MANIFOLD HEATER

ON-VEHICLE SERVICE

INTAKE MANIFOLD HEATER ASSEMBLY
Figures 3.9-1 and 3.9-2

Remove or Disconnect

1. Negative battery cable.
2. Intake manifold heater connector (Figure 3.9-1).
3. (3) manifold heater to intake manifold connecting bolts.
4. Intake manifold heater and gasket from underside of intake manifold (Figure 3.9-2).

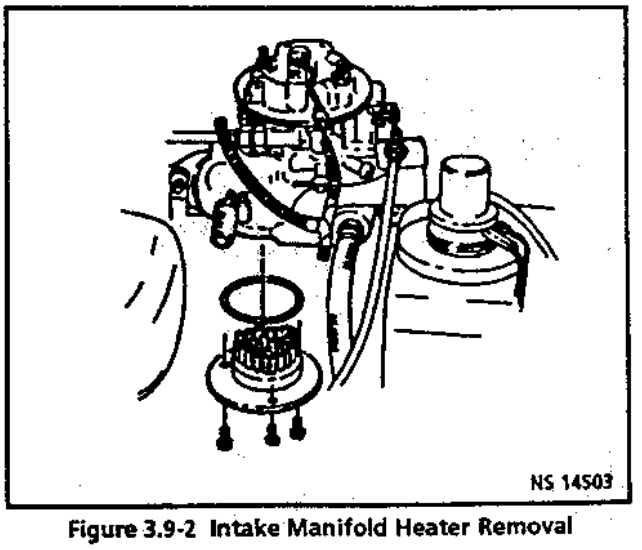


Figure 3.9-2 Intake Manifold Heater Removal

Important

- Inspect gasket for cracks or tears. Replace if necessary.

Install or Connect

1. Intake manifold heater and gasket to intake manifold.
2. (3) manifold heater to intake manifold connecting bolts.
3. Intake manifold heater connector.
4. Negative battery cable.